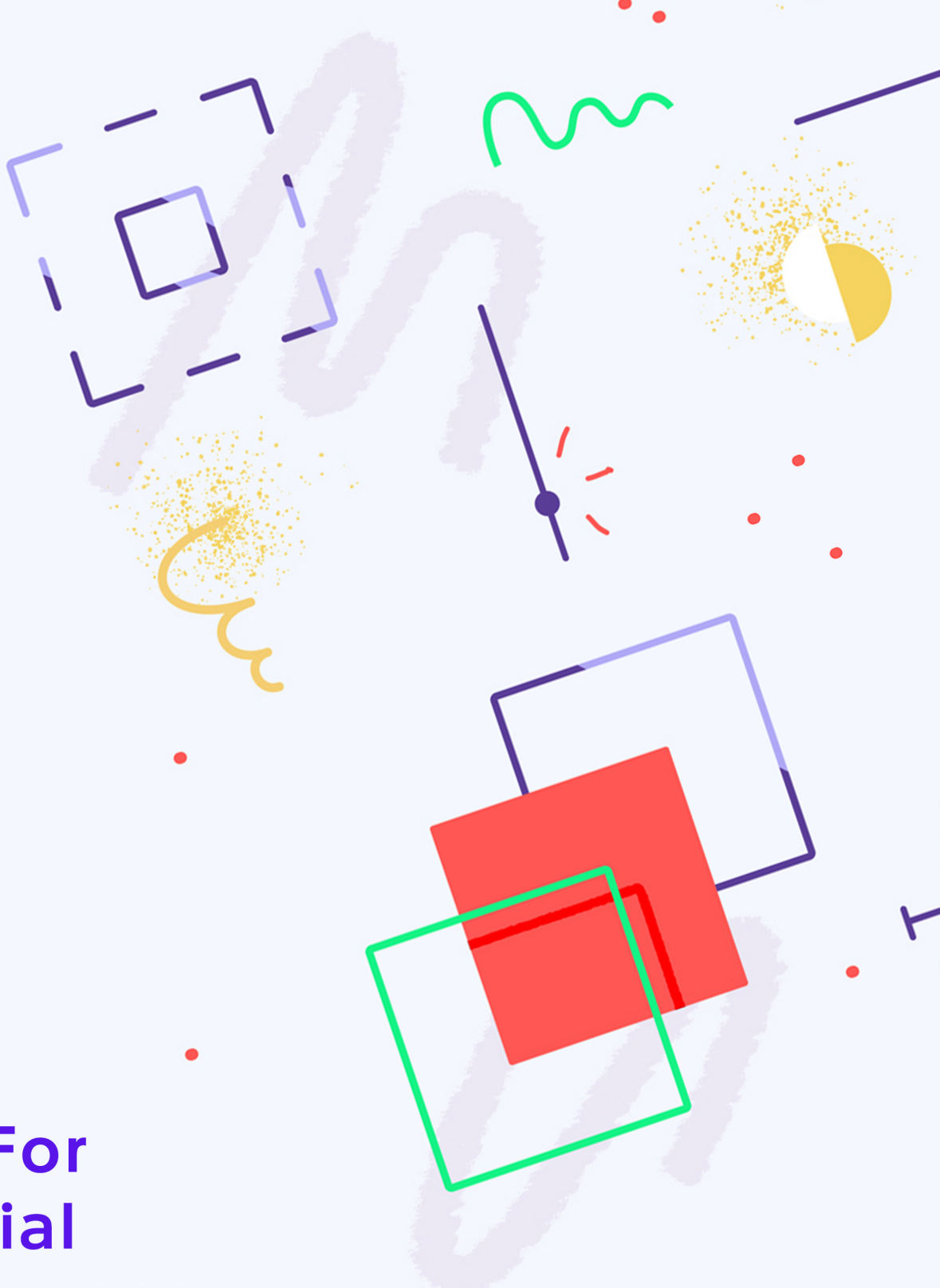

# Trust For Artificial Intelligence

*The trust building journey in automatic bookkeeping*

Master Thesis
Strategic Product Design
**Yue Chen**

TU Delft exact

*October. 2019*

# Trust For Artificial Intelligence

## The Trust Building Journey in Automatic Bookkeeping


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Last but not least, special thanks to my parents. Thank you for always being by my side and supporting me. Your unconditional love is one of the most precious gifts in my life.

# Exacutive Summary

Over the past few years, artificial intelligence (AI) has come to the fore and is now expected to be one of the most disruptive technologies. It is easy to tell that AI will become pervasive in our everyday life. However, people still seem to deeply lack confidence in AI. In a survey for U.S. Consumers(Davenport, 2018), only 9% of respondents said they trusted AI with their financials. Since trust is crucial in the development and acceptance of AI, it is essential to design for proper trust in the human-AI relationship to make people benefit from the technological advance.

In this project, the challenge of trust in AI is explored in collaboration with Exact. Exact is one of the market leading business software companies in the Netherlands. Following the trend of automation in the business software industry, Exact comes up with the future vision of Robotic Accounting. To achieve this vision, they have started integrating AI into their product Exact Online. However, the users seem to stay behind in adopting these automatic features. For example, the usage data shows based on 55-60% accuracy in all the entry proposals that Exact Online automatically create, only 5% of the proposals are accepted by users. Through initial interviews, they find that the lack of trust is one important reason behind the low adoption. Thus, the design assigement is to "find out the reasons that cause a low trust and adoption of users for automation within Exact Online, and design a solution to promote the trust and usage towards Exact existing and to-be designed AI features."

To understand the background and why trust is such a challenging topic in AI, the project starts with literature review around AI and trust. Then two trust models are studied to build the theoretical structure of what is trust and how is trust formed. Based on the two model, a combined trust model which focus more on the elements that will influence trust rather than the mechanism of trust formation is proposed. This model is used as a framework for the later user research. Besides the literature review, the context of Exact and bookkeeping is also studied to define the background of this project and guide the design concept.

After the analysis of theory and context background, two rounds of user research is conducted to know how the users trust AI functions in Exact Online, and how will different elements influence their trust towards : the quantitative research and the qualitative research. The quantitative research is based on the theoretical framework of trust, while the qualitative research is more explorative and could explain the elements with real experience. Insights are generated from the two rounds of research and guide the solution design.

After the research, a strategy pyramid is created for Exact. The strategy pyramid consists of four layers. The fisrt layer is the vision: trust AI like trust your best assistant; The second layer is the strategy: take care of trust for the whole journey; The third layer is the tatical layer: the trust-building guideline. And the last layer is the operationalization: the envisioned product.

The last two layers are further designed. The trust-building guideline is designed into a toolkit that could provoke discussion round trust in the AI development process, and the envisioned product is a redesigned version of Exact Online based on the trust-building guideline. Both the two design concepts are being tested, iterated, and evaluated.

# Table of Contents

*Chapter 01*

# Introduction

This chapter gives an overview of the background of this project and the approach adpoted for the process. First, some background information about AI and its trust issue will be discussed. Then we will look into the company Exact and bookkeeping context. After that, the design challenge is described. Finally, the approach for this project will be introduced.

# 1.1 Project Context

*Trust in AI is the main topic of this thesis. But why it is an interesting topic to look into? Below there will be a short introduction of the rise of AI and how trust will influence the adoption of AI solutions.*

## 1.1.1 The AI Bloom

Today, Artificial intelligence is expected to be "the next big thing". It is infiltrating every industry. Yet we are not always aware of that, we spend so much time with AI services already. In an article by Pedro Uria Recio, the former consultant of McKinsey, it is predicted that "more than 80% of process-oriented tasks will be done by AI systems ... while humans will continue to do more than 80% of cross-functional reasoning tasks" (2019). And Gartner analysts believe that by 2020, Artificial Intelligence will be pervasive in almost every new product and service (Sage, 2019).

## 1.1.2 Trust: The Missing Ingredient

There is a critical underlying assumption in the AI industry: "No trust, No Use" (Marisa Tschopp, 2019). In fact, trust is one of the core drivers of adoption in every new technology. In early studies, trust has been integrated into the technology adoption model (Wu et al., 2011) and widely discussed in different industries such as e-commerce, social networking and healthcare.

Despite a promising future, AI also raises some concerns, like its ability to make important decisions fairly, to be aware and aligned to what people really value when tackling problems, and the capability to explain its decision-making. These concerns may cause an issue of trust in AI and stand in the way of the mass adoption of AI applications.

Thus, to empower people with AI, it is important to consider the trustability of AI when we are building new AI services.

***" Instead of being automatic and expected, trust should be thought of as something that people and organisations have to earn."***

*--- Rachel Botsman, Trust Expert*

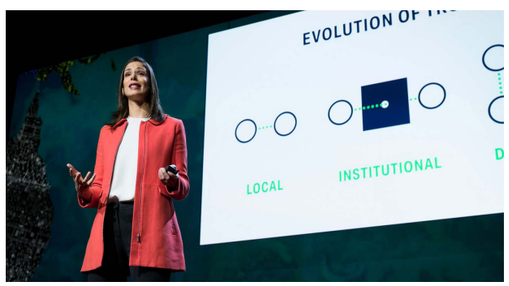



*Figure 1.1 : post TED Summit 2016 – speaker Rachel Botsman ( Pedro Geraldes, 2016)*





# 1.2 About Exact

*This thesis is collaborated with Exact, a Dutch business software company. For this project, the topic "Trust for AI" is mainly explored and discussed in the context of Eaxct softwares and its bookkeeping service. So this section will give an introduction of Exact and its AI strategy.*

## 1.2.1 Who is Exact

In the 1980s, computers came on the market that were affordable for small and medium-sized businesses, that is also when Exact begins and takes its steps towards digitalizing business accounting. Now after 35 years, Exact has become one of the market-leading business software companies in the Netherlands. The vision of Exact is to **support businesses to make smarter decisions, quickly and easily**. With its people, technology, software, and services, Exact aims to enable businesses to act with confidence and clarity to achieve today's goals and tomorrow's ambitions. The business solutions Exact builds


*Figure 1.2 : Exact Office in Netherlands (Exact blog picture)*

are now daily used by more than 400,000 worldwide entrepreneurs and accountants in multiple business sectors. (Exact, 2019)

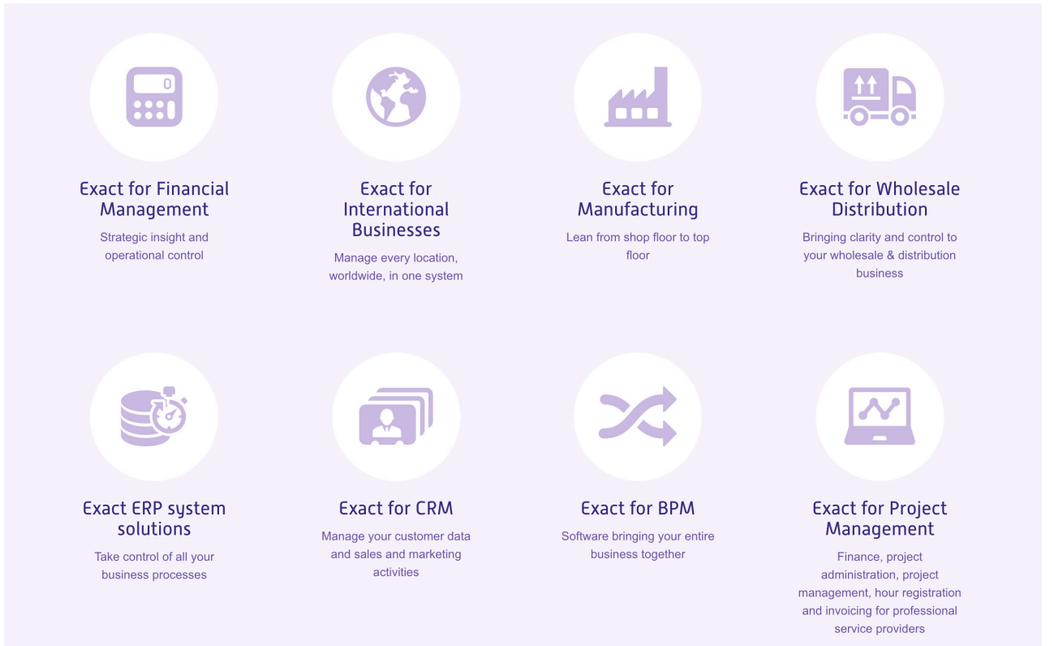



*Figure 1.3 : Overview of Exact Product Portfolio (Exact)*

## 1.2.1 Exact Business Solutions

Exact offers a wide range of business solutions including finance, manufacturing, wholesale distribution, professional services, human resource management (HRM), customer relationship management (CRM) and business process management (BPM). Figure 1.3 shows an overview of the categories of Exact products. These solutions are building on several platforms. Here are the three leading platforms from Exact:

**Exact Online:**
Exact Online is an all-in-one online package. It offers not only accounting and CRM solutions, but also could integrate specific service according to the type of industry.

**Exact Globe:**
Exact Globe is the basis of company's financial and ERP solutions by integrating both the business process and financial administration. It creates a seamless experience for administrators to get insights about the business.

**Exact Synergy:**
Exact Synergy is a platform focused on workflow management and document management. It is a versatile software for CRM, HRM, project management, social collaboration and so on.

## 1.2.2 Exact with AI

In the upcoming years, Exact has the ambition for a future where data entries are all automated and users don't need to do the manual work anymore. Additionally, by using the technology such as artificial intelligence, machine learning, big data and IoT, Exact could provide unique business insights to the clients.

Exact is on its way towards the AI-empowered future. To ensure that with AI, the customers could focus on the work they value rather than spend time doing repetitive work, three directions are proposed by Exact:

***Smart Automation***

*Technology learns how to perform routine tasks and does this as efficiently and intelligently as a human being to save time for users.*

***Data-driven Decisions***

*Smart algorithms identify valuable trend information in financial data and helps user make better business decisions.*

***Continuous improvement***

*The technology is self-learning. The more data from users being process, the smarter it would be.*

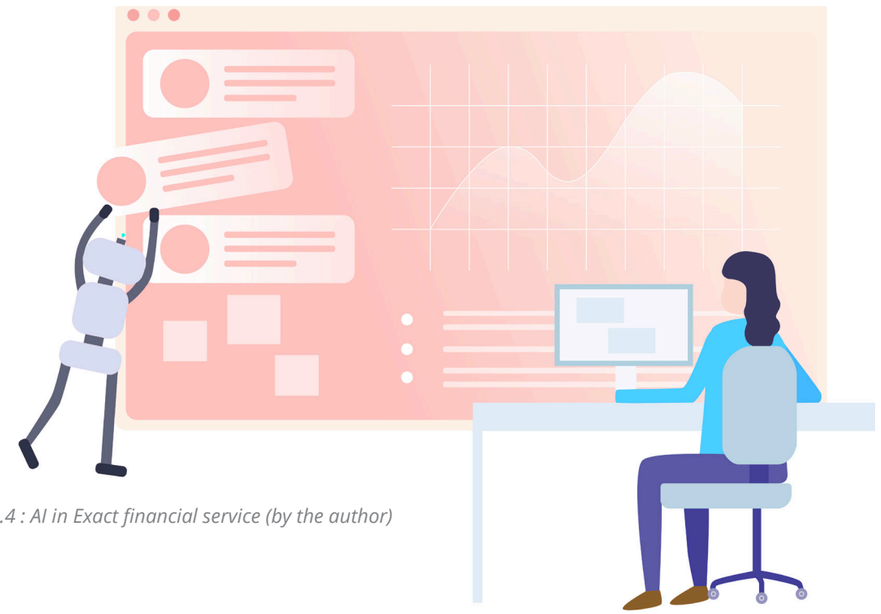


*Figure 1.4 : AI in Exact financial service (by the author)*





With AI automation, Exact provides the users with a promotion of efficiency and effectiveness in their business administration. According to the statistics from Exact, by automating the process that were carried out manually before, customers achieved 89% time-saving on bank transactions and 93% on invoice entries (Exact, 2019).

## 1.2.3 AI in Bookkeeping

As many smart financial softwares do, Exact started their AI strategy with automating bookkeeping process.

Bookkeeping is the basis of a firm's accounting system. In a nutshell, bookkeeping involves all daily recording of financial transactions. Typical tasks of a bookkeeper could be:

- Billing for goods sold or services provided to clients
- Recording receipts from customers
- Verifying and recording invoices received from suppliers
- Paying suppliers
- Processing employees' pay and the related governmental reports
- Monitoring individual accounts receivable
- Recording depreciation and other adjusting entries
- Providing financial reports

( Harold Averkamp )

How is AI applied to bookkeeping? Figure 1.5 shows the automatic bookkeeping from SMACC, a Germany smart accounting software with built-in AI., which could represent the typical automated invoicing process. Three touchpoints will be automated by AI in the workflow:

***Read and interpret data from physical or digital documents***

*With text recognization, AI extracts key information from the invoice and fill in the entry form.*

***Automatically allocate items to specific accounts***

*By learning from the database of entries, AI could assign items to specific administration accounts.*

***Automatic reconciliation of bank transactions and invoice statements***

*AI looks into bank transactions and invoice entries and reconciliate the ones that match each other.*

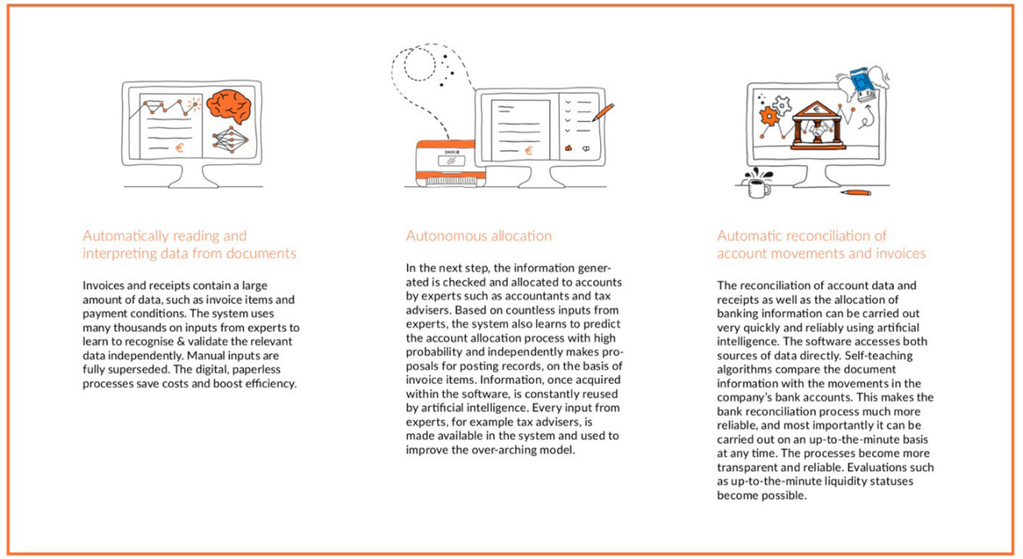



*Figure 1.5 : Automatic bookkeeping process of SMACC (SMACC, 2019)*

# 1.3 Project Brief & Approach

*This section describes the trust challenge Exact AI is now facing and the project brief based on the challenge. After that, the design approach for this project will be proposed according to the design brief.*

## 1.3.1 Challenge

In this project, the challenge of trust in AI is explored in the case of Exact. Following the trend of automation in the business software industry, Exact comes up with the future vision of Robotic Accounting. They believe by reducing the manual work, their users could work more efficiently and spend time on more valuable work. To achieve this vision, they have started integrating AI into their product Exact Online.

However, the users seem to stay behind in adopting these automatic features. For example, the usage data shows based on 55-60% accuracy in all the entry proposals that Exact Online automatically create, only 5% of the proposals are accepted directly by users. Through their initial interviews, they find that the lack of trust is one important reason behind the low adoption.
In this case, it would be helpful for Exact to find a solution to **make the users appropriately trust the automation within Exact Online** and finally be empowered in their work.

### Design Assignment

*Find out the reasons that cause a low trust and adoption of users for automation within Exact Online, and design a solution to promote the trust and usage towards Exact existing and to-be designed AI features.*

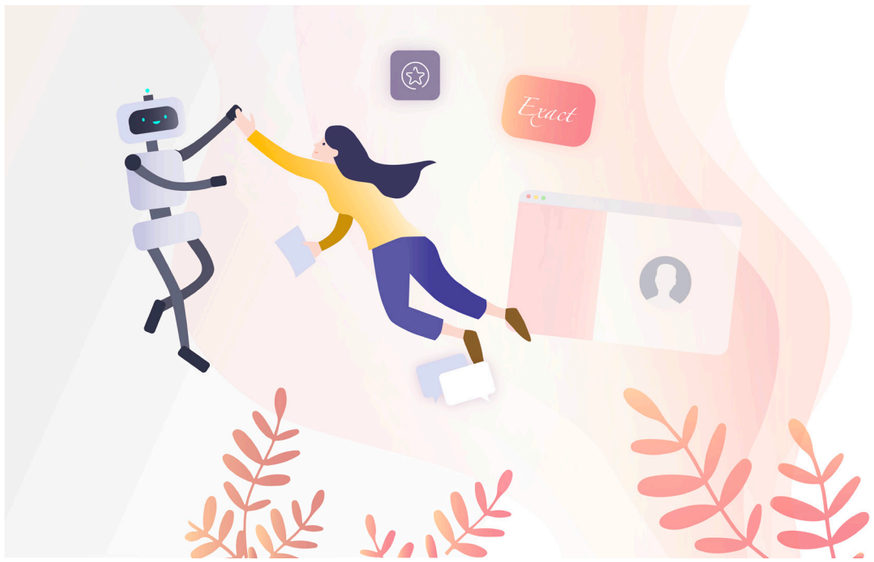



*Figure 1.6 : The vision of a trustworthy human-AI collaboration within Exact Online (illustrated by the author)*





## 1.3.2 Scope

### Exact Online

Exact Online is a cloud-based financial software which is one of the leading platform in Exact portfolio. It will be the main product to be studied in this project.

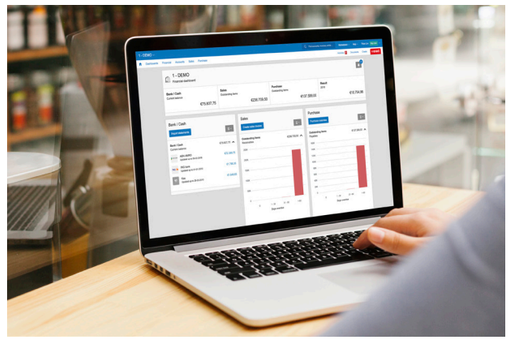


*Figure 1.7 : Exact Online Screen*

### Target Users

Exact Online aims at the market of small and medium-sized enterprises (**SMEs**). There are two typical gruops of users in Exact Online. One of them is the **bookkeeper (accountant)**, the other one is the **entreprenuer** who do the bookkeeping themselves.

***Bookkeeper/Accountant***

*Professional with finance*
*Have a cautious personality*
*Less tolerant with mistakes*

***Entrepreneur***

*Know little about finance*
*Less cautious about bookkeeping*
*More tolerant with mistakes*

## 1.3.3 Research Quetions

To tackle with the design challenge, the following research questions should be answered by this project.

1/ What are the elements that influence trust when people are using AI applications?

2/ How do the users experience trust with the existing Exact Online AI features?

3/ What kind of strategy should Exact take to solve the trust issue in a long term?

4/ How to use the strategy to support users build proper trust towards Exact Online AI features?

## 1.3.4 Project Approach

To answer these research questions, the project approach is defined and shown in Figure 1.8.

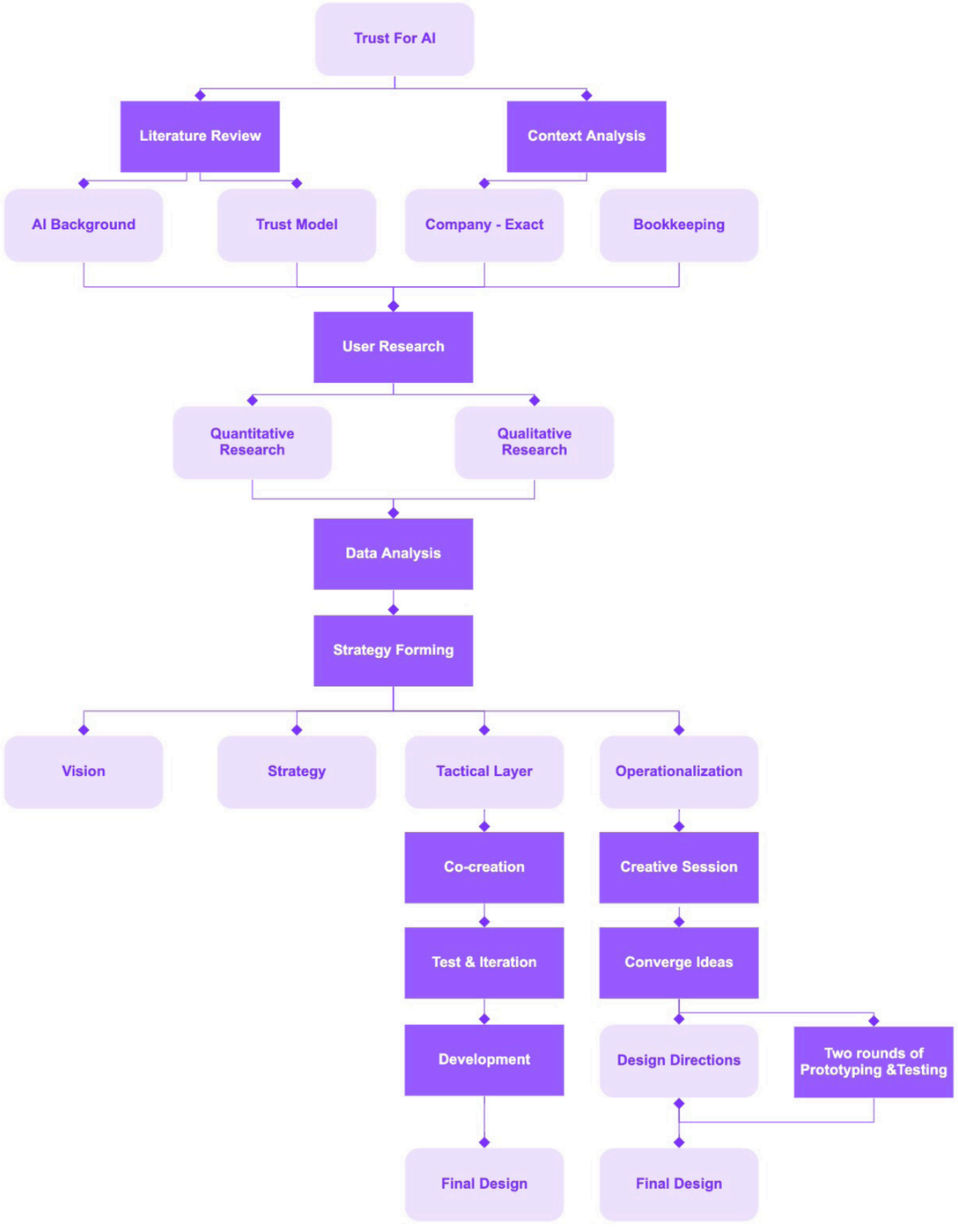



*Figure 1.8 : Project Approach*

*Chapter 02*

# AI at A Glance

Before designing for AI, it is necessary to first have an overview of  AI. This chapter first explains what is AI, and then looks into the technology and capabilities of it. The applications of AI and current discussions around it are also introduced.

# 2.1 What is AI

*This section gives the background knowlegde of AI. It starts from the definition of AI, then introduces the different types of AI when considering its capability. And a brief intepretation of the techonology behind AI will be addressed.*

## 2.1.1 Definition of AI

Over the past few years, artificial intelligence (AI) has come to the fore and is now expected to be one of the most disruptive technologies. In figure 2.1, the Gartner Hype Cycle shows the development and trend in AI industry. However, the term AI itself might not be new as it sounds like, it is first coined in 1956 by John McCarthy (Brian McGuire et al., 2006). Thanks to the increased data volumes, advanced algorithms, and improvements in computing power and storage, AI has become more popular today than ever.

What is AI? While there is no universal definition of this term, AI generally means:

*"a computerized system that exhibits behavior that is commonly thought of as requiring intelligence" (NSTC, 2016).*

## 2.1.2 Three Types of AI

The AI landscape is crowded with all different

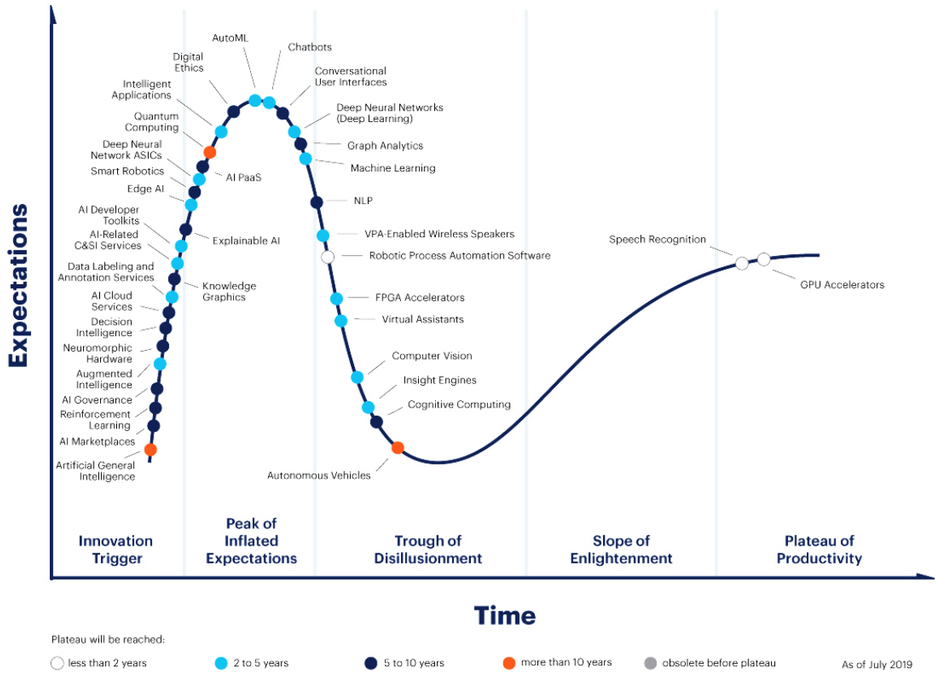



*Figure 2.1: Gartner Hype Cycle for Artificial Intelligence, 2019 (Source: Gartner)*





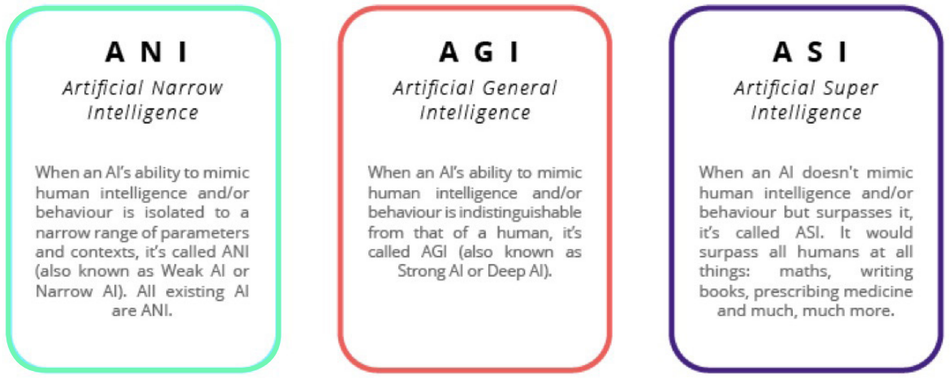



*Figure 2.2 : Three types of AI. Illustrated by the author. Source: Dickson, B. (2017).*

kinds of technology. How could we categories AI? A common way to divides AI into different types is to distinguish them by the ability to mimic human intelligence and behaviour. In this case, we will have three types of AI. They are **Artificial Narrow Intelligence (ANI)**, **Artificial General Intelligence (AGI)** and **Artificial Super Intelligence (ASI)**. The description of each type is illustrated in figure 2.2. At this stage, all existing AI is ANI.

## 2.1.3 AI Technologies

When we talk about AI, it might refer to a range of technologies including machine learning, deep learning, computer vision, natural language processing (NLP), and machine reasoning (Jean Paul Simon, 2019). According to a survey conducted by Microsoft, we could see how different technologies are being used now in AI industry (Figure 2.3).

Due to the wide-ranging applicability, machine learning is possible to make value in a variety of use-cases, and becomes the most commonly used technology within AI. That is why these days we are always confused by the misconceptions around AI and Machine Learning.

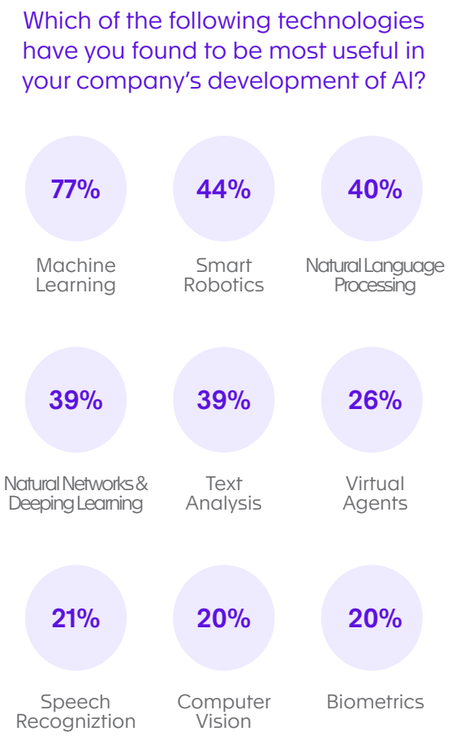



*Figure 2.3 : How technologies are used in AI (Source: Microsoft "Artificial Intelligence in Europe How 277 Major Companies Benefit from AI Sweden Outlook for 2019 and Beyond")*

***As for this project, the technologies applied in Exact Online is basically Machine Learning and Text Analysis.***

### 2.1.4 Machine Learning

Machine learning is based on algorithms that can learn from data without relying on rules-based programming (Pyle and Jose, 2015). There are two types of techniques that are being used to achieve machine learning . One is the Unsupervised Learning and the other one is Supervised Learning. Figure 2.4 shows how Machine Learning works based on these two techniques. For Unsupervised Learning, no predefined categories are provided beforehead, the machine classifies the input date based on the clustering itself. And for Supervised Learning, the machine takes a known set of output data towards the input data, and generate a model to predict the new input.

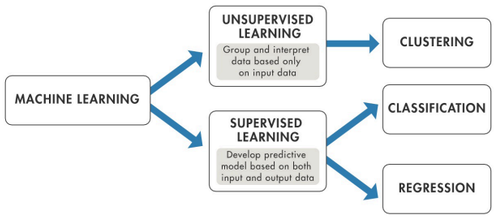



*Figure 2.4: Two types of Machine Learning process (Source: Mathworks)*





# 2.2 AI to Apply

*To give a sense of reality to the futuristic-sound term AI, let's look into how AI is applied in the industrial and business world. This section will show the picture of AI applications and the trendy topics around AI.*

### 2.2.1 AI Everywhere

Think about the autonomous vehicle, companies like Ford are expected to deliver their "true self-driving" car in 2021(Belvedere, 2017). But AI is not something only far in the future. When Netflix recommends you watch "Modern Family" after you've finished "Friends," an AI algorithm decided that would be the next thing for you to watch (Dickey, 2017). When you received a fraud mail in your Gmail account, an AI algorithm identify it and send it to the "Junk" folder... AI is everywhere in our daily life. Figure 2.5 shows a range of AI applications in the market.

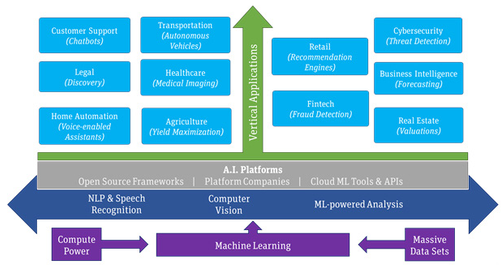



*Figure 2.5 : Examples of AI-enabled applications. (Souce: Garza 2018)*

How AI is developed and adopted varies significantly by sector and within sectors. Figure 2.6 shows that the industries that shows a high adoption to AI now is also expected to grow rapidly in the following years. These leading sectors are financial services, retail, health care, and advanced manufacturing.

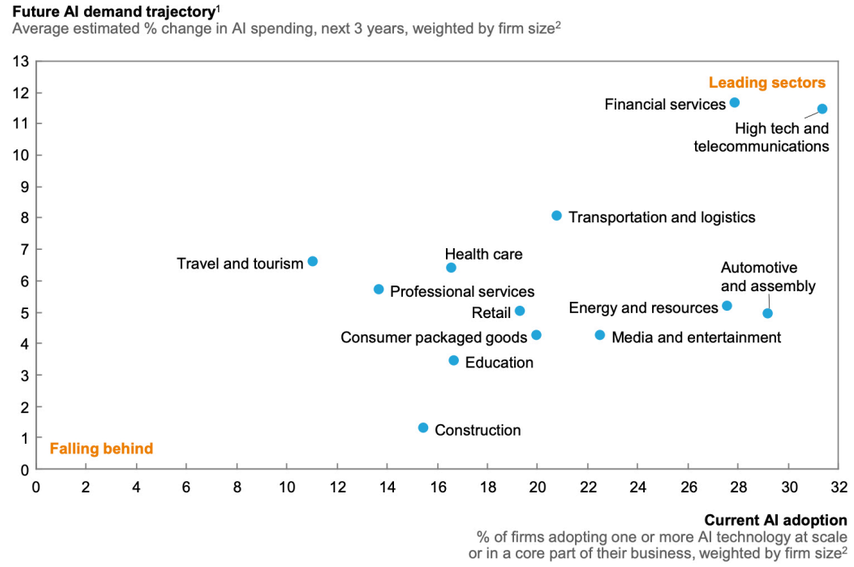



*Figure 2.5 : Sectors leading in AI adoption (Souce: McKinsey Global Institute AI adoption and use survey; McKinsey Global Institute analysis)*

*Since the financial services is one of the leading sectors in AI usage, it makes sense to start with it as a "test field" for the trust challenge.*

## 2.2.2 Main Roles of AI

So what exactly does AI do for people? In Figure 2.6, AI – empowered functions are shown. The top two functions of AI is to predict outcomes(74%) and to automate manual tasks (72%). Besides, AI is also used to generate insights based on patterns, personalize the content for users and prescribe for defined problems (EY for Microsoft, 2018).

Within Exact Online, the existing AI service is mostly about automation on the bookkeeping process. In the same time, they are planning to add more insights about prediction of financial status as well.

## 2.2.3 Discussions Around AI

Like other technologies, AI is developed to create value for human. Along with the development and application of AI, mroe and more aspcets about human values come to the discussion around AI. Three widely discussed ethical challenges related to trust are addressed below (Joël van bodegraven, 2018):

### Privacy:

Based on using the big data, it seems uneveitable for AI to meet with the problem of privacy. Nowadays people are becoming more and more cautious when asked to share their data with another institute or company. The concern about privay could stop user from trusing AI.

### Transparency and Control:

People like to be in control and understand why AI gives a certain result. However, most outcomes from AI are based on the pattern it found, and are perceived as a black box without explaiation. Further discription about the "black box" issue will be shown in Chapter 3.1.3.

### Alienation of Human Capabilities:

AI continuously distills the human skills and knowledge into algorithms. This may lead to a potential danger that the more we rely on AI, the less we know the why and how. This may lead to the the distrust about the intention of AI.

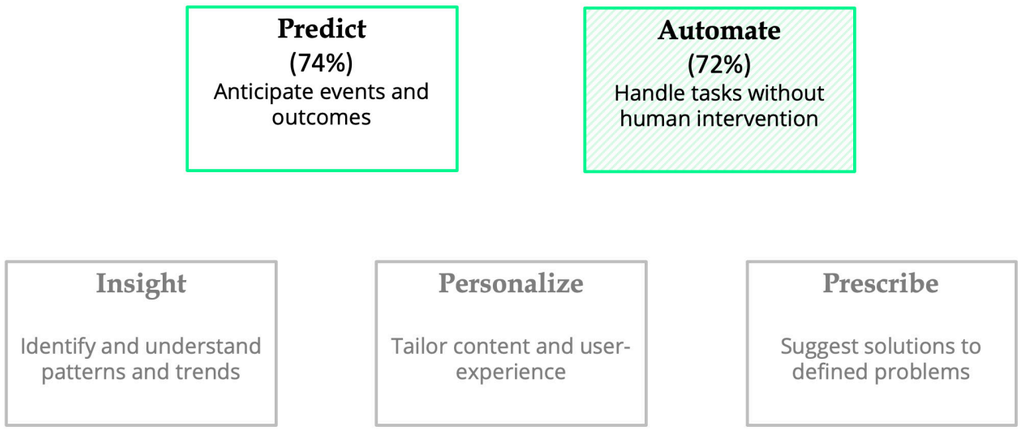
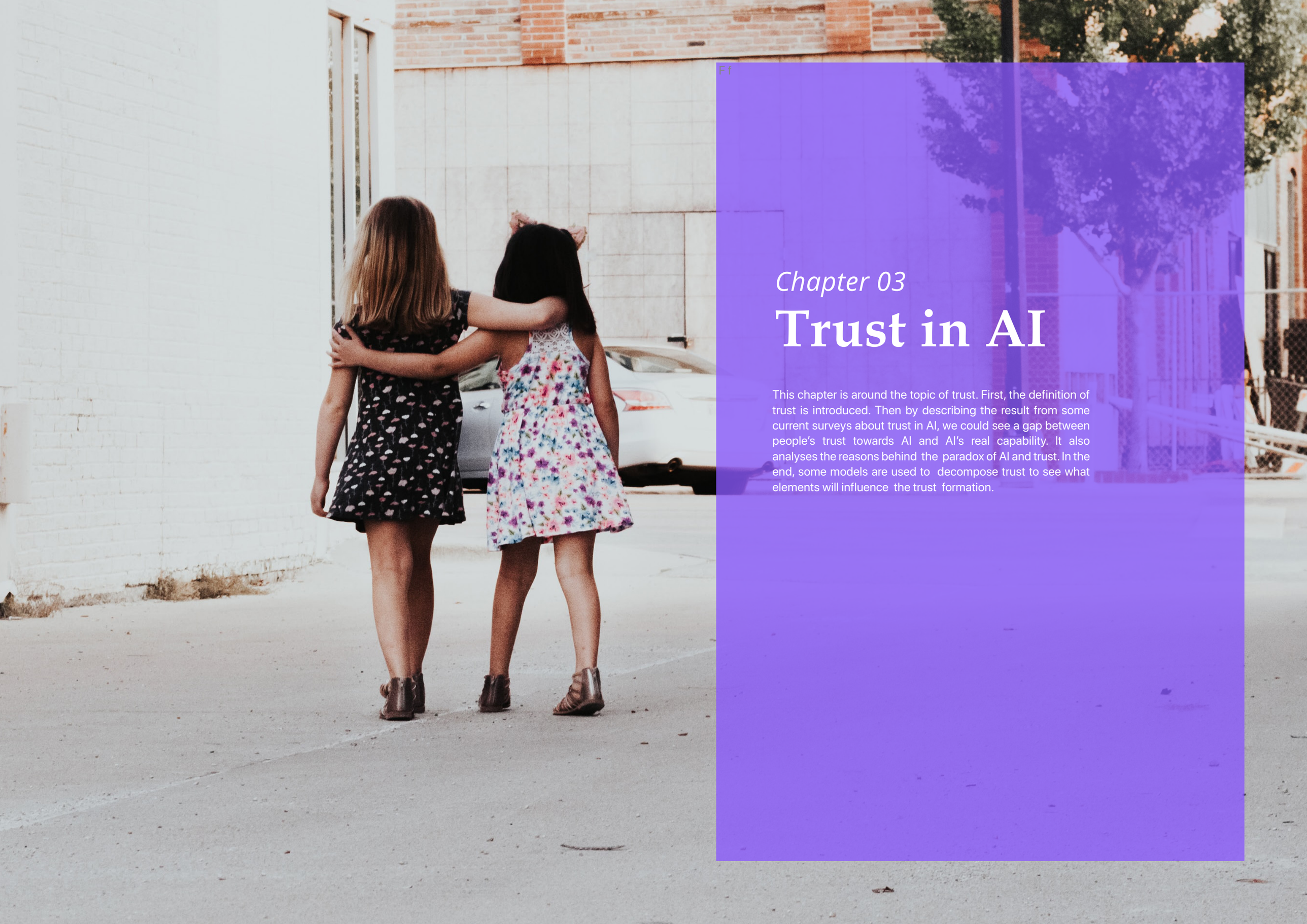



*Figure 2.6 : Main functions of AI (Souce: < Artificial Intelligence in Western Europe: How 277 major European companies benefit from AI > Microsoft )*



*Chapter 03*

# Trust in AI

This chapter is around the topic of trust. First, the definition of trust is introduced. Then by describing the result from some current surveys about trust in AI, we could see a gap between people's trust towards AI and AI's real capability. It also analyses the reasons behind the paradox of AI and trust. In the end, some models are used to decompose trust to see what elements will influence the trust formation.

# 3.1 Introduction to Trust

*What is trust? What does it mean when we use to discribe human - AI relationship? And what is the current situation of trust for AI solutions? This section will answer these questions. Besides, it will also discuss the reason why trust remains a interesint topic in AI.*

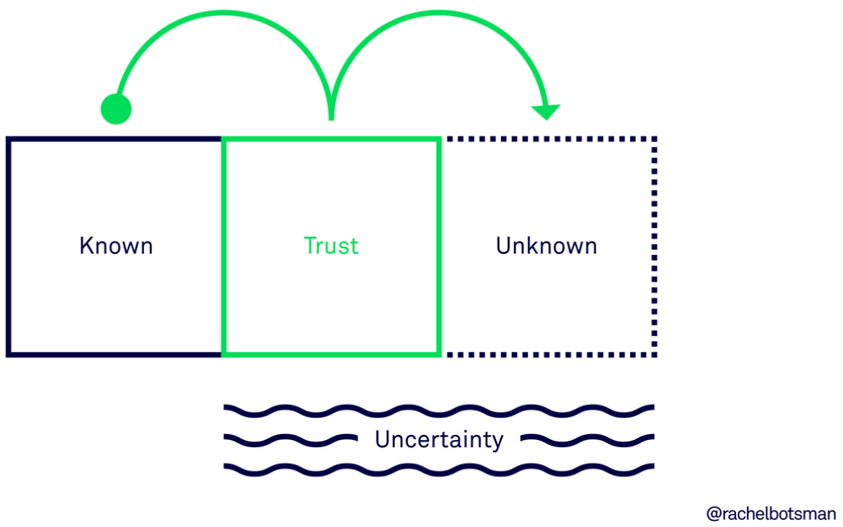



*Figure 3.1: A illustration of trust definition (Source: Rachel Botsman)*

## 3.1.1 Define Trust

Trust is a social construct that originates from interpersonal relationships (Dagli, M. 2019). The definition of trust has been widely debated for years. But all of these different definitions are related to how people deal with uncertainty. So Rachel Botsman uses a simple definition to interpret trust: trust is *"a confident relationship with the unknown" (Bostman, 2017).*

When it comes to the context of AI, trust can be defined as *the attitude that an agent will help achieve an individual's goals in a situation characterized by uncertainty and vulnerability (Lee and See, 2004).*In this case, the agent means the AI program, and trust could be interpreted how confident are you when you try to rely on the AI program to do a task for you.

## 3.1.2 How Do We Trust AI

With AI technology, we can do incredible things with data, and create lots of application after processing the input. However, how much do people trust the outcome of the program? How much will people accept what AI systems tell them (KHALEGHI, 2018)?

In fact, the lack of appropriate trust has caused many failures in AI applications. One of the most famous cases is the IBM Watson for Oncology. "IBM's attempt to promote its supercomputer programme to cancer doctors (Watson for Oncology) was a PR disaster," says Vyacheslav Polonski, Ph.D., UX researcher for Google and founder of Avantgarde Analytics. "The problem with Watson for Oncology was that doctors simply didn't trust it." (Bloomberg, 2018)





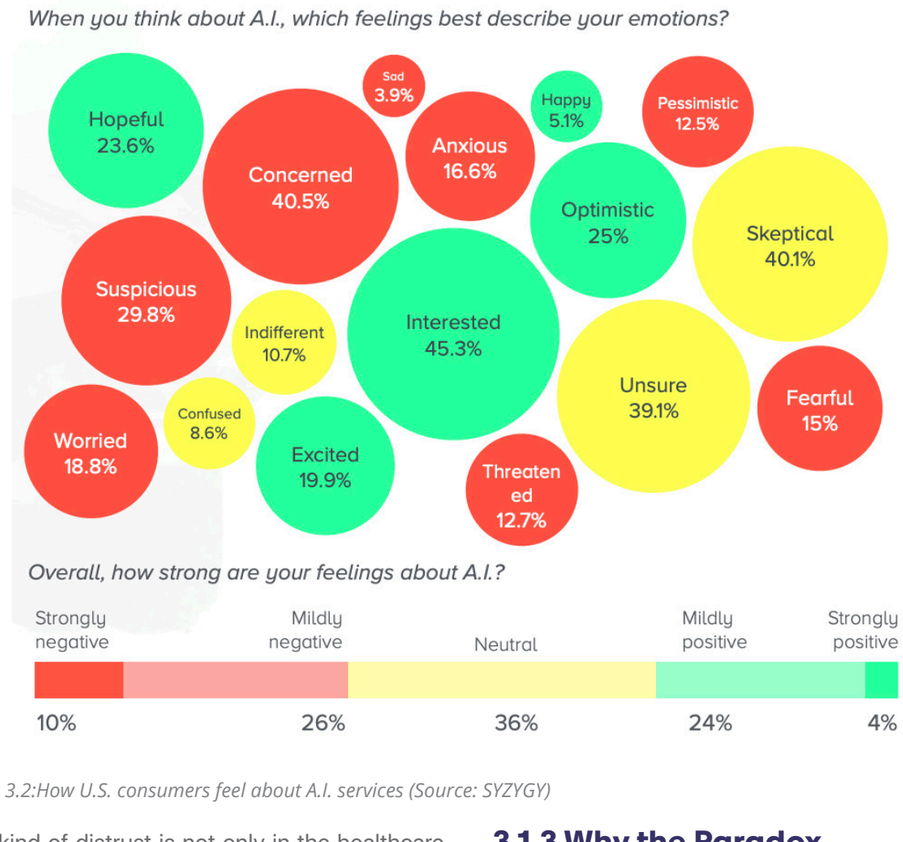



*Figure 3.2:How U.S. consumers feel about A.I. services (Source: SYZYGY)*

This kind of distrust is not only in the healthcare context. In the survey of U.S. consumers from SYZYGY, a digital transformation consultancy, when people are asked about their feelings towards AI (Figure 3.2), the top five words turns to be Interest (45%), Concerned (40.5%), Skeptical (41%), Unsure (39.1%) and Suspicious (29.8%). We could see how users feel reluctant to use AI applications (SYZYGY, 2017).

In another survey from U.S., When presented with a list of popular AI services (for example, home assistants, financial planning, medical diagnosis, and hiring), 41.5% of respondents said they didn't trust any of these services. Only 9% of respondents said they trusted AI with their financials, and only 4% trusted AI in the employee hiring process (Davenport, 2018).

If we do not change the situation of trust, it would be hard for us to make the full out of AI.

## 3.1.3 Why the Paradox

As we could see, trust is not a specific challenge for Exact Online AI functions, but instead a general challenge for all the AI applications. But why trust is a topic that worth attention in the AI context? It is determined by the paradox between the characteristics of trust and AI.

### Trust Mechanism

- In the formation of trust, though there are two types of feedback loops, the positive feedback loop and the negative feedback loop, the negative feedback loop could engender a much stronger impact on trust when compared to the positive feedback loop (Yang, 2016). This means it is easier to disrupt trust with a bad performance than to promote trust with a good performance.

- The relationship between trust and

performance is not linear. It tends to be conditioned by the worst performance of the AI system. And the initial experience will have a long-lasting influence on trust. Trust is more resilient if automation reliability starts high and declines than if it starts low and increases (Lee & See, 2004). In other words, it's harder to recover trust if the user has a bad impression in the beginning.

- Below a certain level of reliability, trust declines quite rapidly (Lee & See, 2004). The level of this drop-off is highly dependent on the context, with estimates ranging from 90% (Moray et al., 2000) and 70% (Kantowitz et al., 1997a) to 60% (J. M. Fox, 1996).

### AI Learns From Mistakes

AI's ability is not pre-defined but learned. The performance of AI is evolving with mistakes. The more AI is assigned to execute tasks, the better the result could be. In this case, AI tends to make mistakes in the beginning when the database is not big enough.

### Black Box and Explainable AI

One of the biggest challenge in many cutting-edge AI services is the "Black Box" issue. Due to the self-learning approach and the complex connections made of AI models, it is hard to explain how and why AI algorithms give a certain result. Most of the time, people feed AI with data and get an outcome without understanding the logic behind it. This issue causes a big crisis of trust.

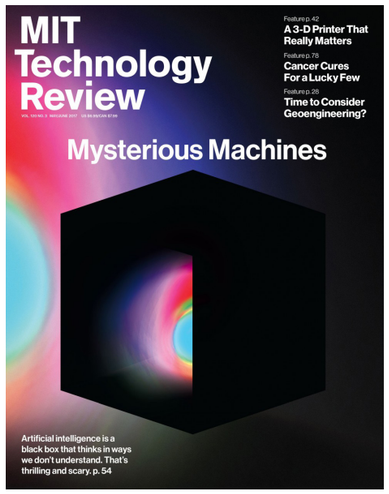



*Figure 3.3: MIT Technology Review talks about "Black Box" of Artificial Intelligence*

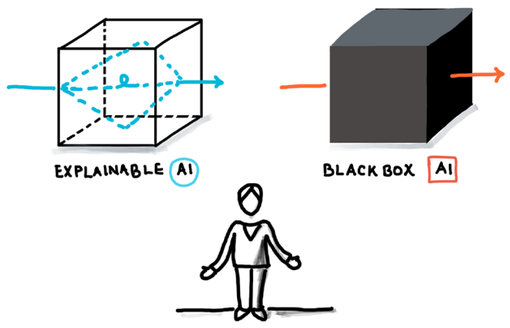



*Figure 3.4: Explainable AI and Black Box AI (Kursat Ozenc , 2018)*

Thus, there is a call for Explainable AI (XAI), which is the principle to unmisitying the "Black Box". According to the definition from Accenture:

> *"Explainable AI (XAI) is defined as systems with the ability to explain their rationale for decisions, characterize the strengths and weaknesses of their decision-making process, and convey an understanding of how they will behave in the future."*

With explainable AI, we could enhance the trust by opeing the black box of AI.





# 3.2 Decomposing Trust

*Defined as an attitude and propensity, trust will be influenced by many elements. In order to design for trust, literature review is conducted to understand the development of trust and what elements will influence trust.*

## 3.2.1 Appropriate Trust

First, it is vital to set the aim of what kind of trust do we want to achieve. Do we want our users to trust AI as much as possible? The answer is no. Mistrust could stop users from trying to use AI, while overtrust could lead to a trust fall later when users find the outcome is not as satisfying as they expected.

As a result, we should facilitate the development of appropriate trust. The appropriate trust means the level of trust that corresponds with the ability of the AI system.

## 3.2.2 Bases of Trust

Trust is influenced by different kinds of factors. Lee and See (2004) defines performance, process, and purpose as the bases of trust in automation:

### Performance:

Performance refers to the current and historical operation of the automation. It includes characteristics such as reliability, predictability and ability.

### Process:

Process is the degree to which the algorithms of the automation are appropriate for the situation and able to achieve the user's goals.

### Purpose:

Purpose refers to how the automation is being used within the realm of the designers' intent. Purpose describes why the automation was developed.

## 3.2.3 Trust Models

So how do these elements influence trust? Two models of trust formation will be introduced in this section to reveal the mystery of trust. Since automation is one of the most representative functions within general AI applications as well as the context of Exact Online case, trust models around automation are studied.

## 1. Model of the dynamic process that governs trust and its effect on reliance

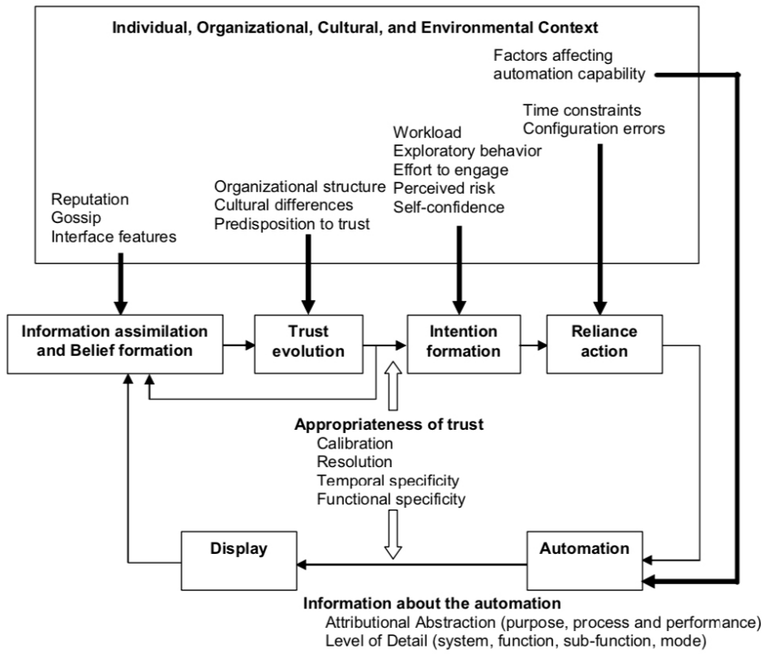



*Figure 3.4: A conceptual model of the dynamic process that governs trust and its effect on reliance (Lee & See, 2004)*

Figure 3.4 shows the model of the dynamic process that governs trust and its effect on reliance (Lee & See, 2004). The framework includes three essential parts: the closed-loop dynamics of trust and reliance, the importance of the context on trust and mediating the effect of trust on reliance, and the role of information display on developing appropriate trust.

The dynamics loop of this model shows that the interaction with the automation system will have an influence on trust, and at the same time, trust will also influence the interaction with the automation system by forming intention and action.

The context factors will influence the development of trust and reliance. These factors may from individual context (like the predisposition to trust and self-confidence), organizational context (like organizational structure), cultural context (like cultural difference) and environmental context (like time constraints). And these factors could affect different stages of trust and reliance development.

The "information display" is another crucial part that influences trust. This means how the three bases (purpose, process and performance) of the automation are displayed and conveyed to the user will influence their trust for automation.

### Reflection on this model:

This model gives an overview of the process of how trust and the interaction with automation influence each other step by step. It also has a detailed description of the context elements that will impact trust and reliance. In addition, it addressed the importance of displaying information about the automation. However, the simple categories of purpose, process and performance are not concrete enough to show the elements about the automation itself. Hence, a second model is studied.





## 2. Model of factors of trust development in automation.

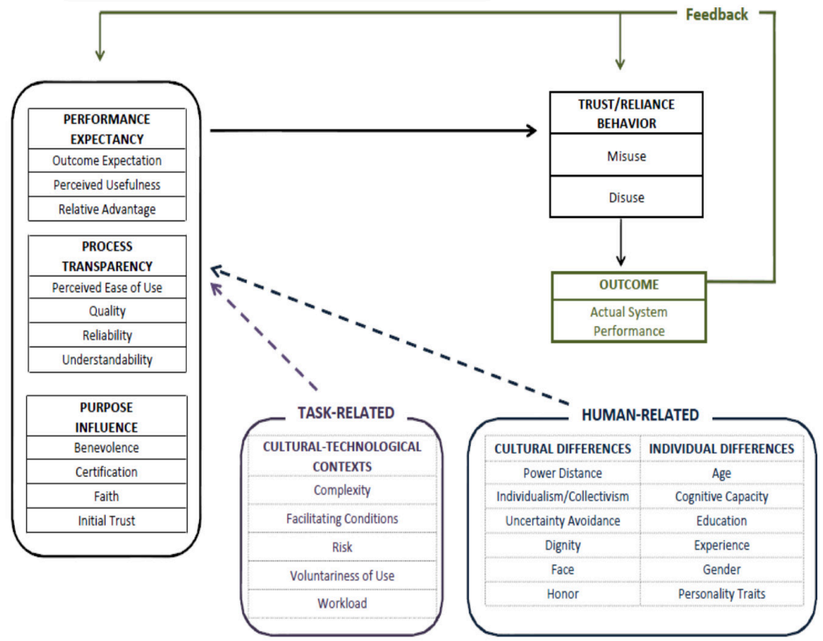



*Figure 3.5: Model of factors of trust development in automation. (Chien, 2016)*

Figure 3.5 shows the model of factors of trust development in automation (Chien, 2016). It mainly discussed the factors that will influence trust. Performance expectancy, process transparency, and purpose influence are the constructs (solid lines); individual differences, task contexts, and cultural differences are the moderators (dotted arrows).

For constructs, it explains the three categories and creates sub-categories for them. For example, outcome expectation, perceived usefulness and relative advantage are the elements from Performance Expectancy; perceived ease of use, quality, reliability and understandability are from Process Transparency; benevolence, certification, faith and initial trust are from Purpose Influence.

For moderators, they are divided into Task-Related and Human-Related. Elements from the cultural-technological contexts that will influence the task are Task-Related elements, such as the complexity of the task, the risk of the outcome and the workload of the tasks. Among Human-Related elements, there might be cultural differences like the power distance, uncertainty avoidance and dignity, or individual differences like age, cognitive capacity and experience.

### Reflection on this model:

Compared to the first model, this model simplifies the path of trust formation. Instead, it puts more attention on the factors that will influence trust, which could be more helpful in guiding the design for trust. It gives more explanation on performance, process and purpose elements, while also clusters the context elements into task-related and human-related. However, for this project, cultural sensitivity is not the main focus. As a result, a summarized model based on these two models is proposed for this project.

### 3.2.4 A Summarized Model

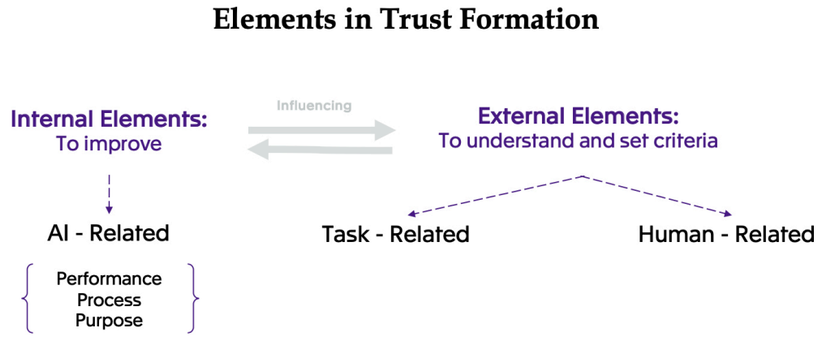



*Figure 3.6: Trust model overview*

By combining these two models with the elements extracted from other literature reviews, a summarized model is created. What's more, the structure of the model is modified to be more applicable for the project.

Figure 3.6 shows an overview of the summarized model. There are two main groups of elements that will influence trust formation: The internal elements and the external elements.

The internal elements are elements directly related to AI, which could be divided into performance, process purpose elements. When integrated into design process, these internal elements should be improved to gain the appropriate trust from users.

Except from being divided into performance process, purpose, these elements could also be divided into "Capability" and "Communication". "Capability" stands for the traits of the AI system itself, like ease of use and usefulness. "Communication" stands for the traits that could convey ability of the AI system, like transparency and appearance.

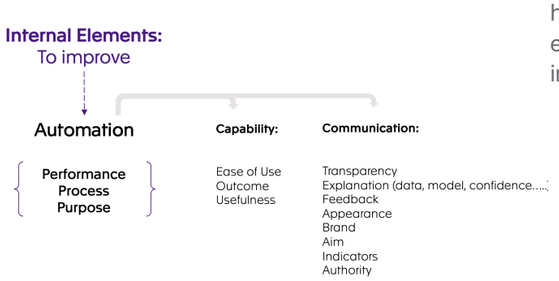



*Figure 3.7: Trust model - internal elements*

The external elements are elements that are not directly related to AI, but will influence the trust towards AI. These are mostly elements from the context. They could be task-related elements or human-related elements.

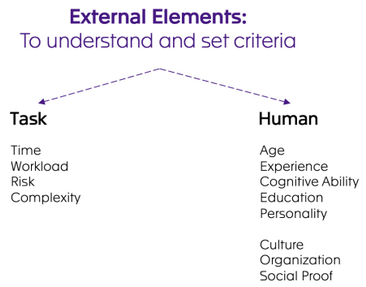



*Figure 3.8: Trust model - external elements*

For task-related elements, they could be time constraints, workload, risk or complexity. For human-related elements, they could be age, experience, personality, culture influence or social influence from others' opinion.



## Key Takeaways From Chapter 03

1. The trust issue is not only a problem for Exact Online, but a general challenge for AI applications.

2. The following characteristcs of trust and AI makes the trust issue an interesting topic in AI context:

The influence on trust from bad performance is much stronger than the influence from good performance.

Intial experience is important for trust, since it is hard to win trust back once it is destroyed.

Below a certain level of performance, trust declines fast.

AI tends to make mistakes in the biginning because its ability is learned and it keeps evolving.

The black box of AI makes it hard to be explainable.

3. The key to solve the trust issue is to build appropriate trsut.

4. The bases of trust are performance, process and purpose of AI.

5. Besides, external elements from the environment will also influence people's propensity to trust.

*Chapter 04*

# Context Dive

This chapter will give more insights about the context of this project. It starts with sensitizing with the bookkeeping work. Then it will introduce the findings from the internal interview within Exact about their AI strategy and functions. In the end, the existing experience within Exact Online AI workflow will be analyzed.

# 4.1 Bookkeeping

*This section is about sensitizing with the bookkeepers and their bookkeeping work. It could hlep us find the design opportunity and makes sure the final design solution could fit with their working habits.*

## 4.1.1 Method

Bookkeeping is a specific part of financial administration. To create more empathy with the users, I start with researching on their daily routine of doing bookkeeping. The research questions are showe below:

1. What are the main tasks for bookkeeping?

2. What is the workflow of these tasks?

3. Is bookkeeping periodic work? If so, how does the period look like?

4. What does the daily routine of a bookkeeper look like?

The results from the research come from the combination of desktop research and context-mapping with users. For the online desktop research, self-reporting videos and blogs are viewed to know the feelings of users about their work from a more personal perspective. Pictures from figure 4.1 show some screenshots of these online videos and blogs. The context mapping process will be described in the next chapter (chapter 05 User Research) since it covers more topics such as how they trust Exact Online now.

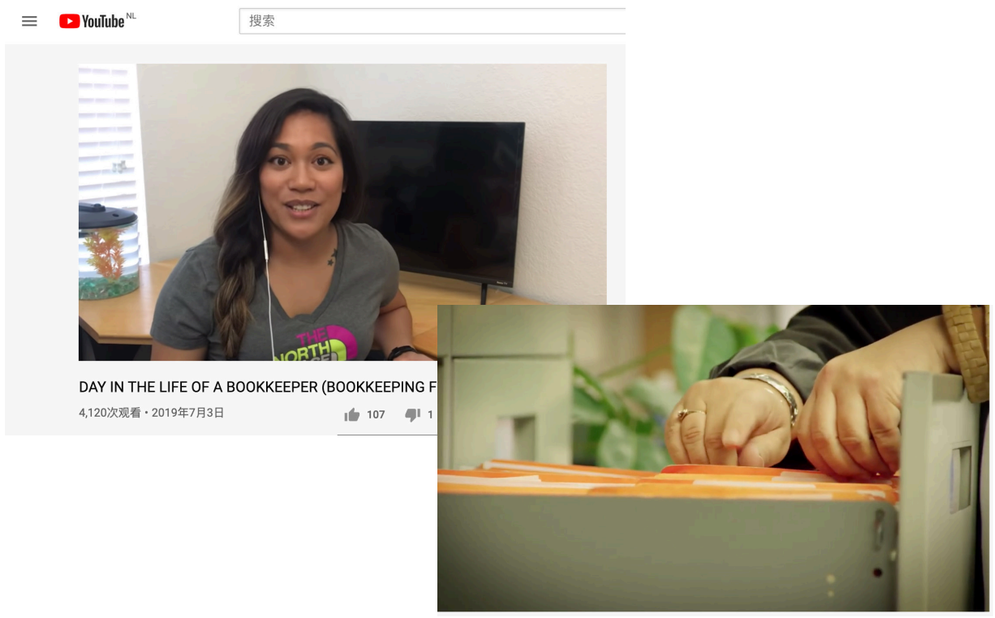



*Figure 4.1: Self-report videos online from bookkeepers*

## 4.1.2 Result

The findings from the research is mapped into the illustration of the customer journey of bookkeeping (Figure 4.2). (See next page)

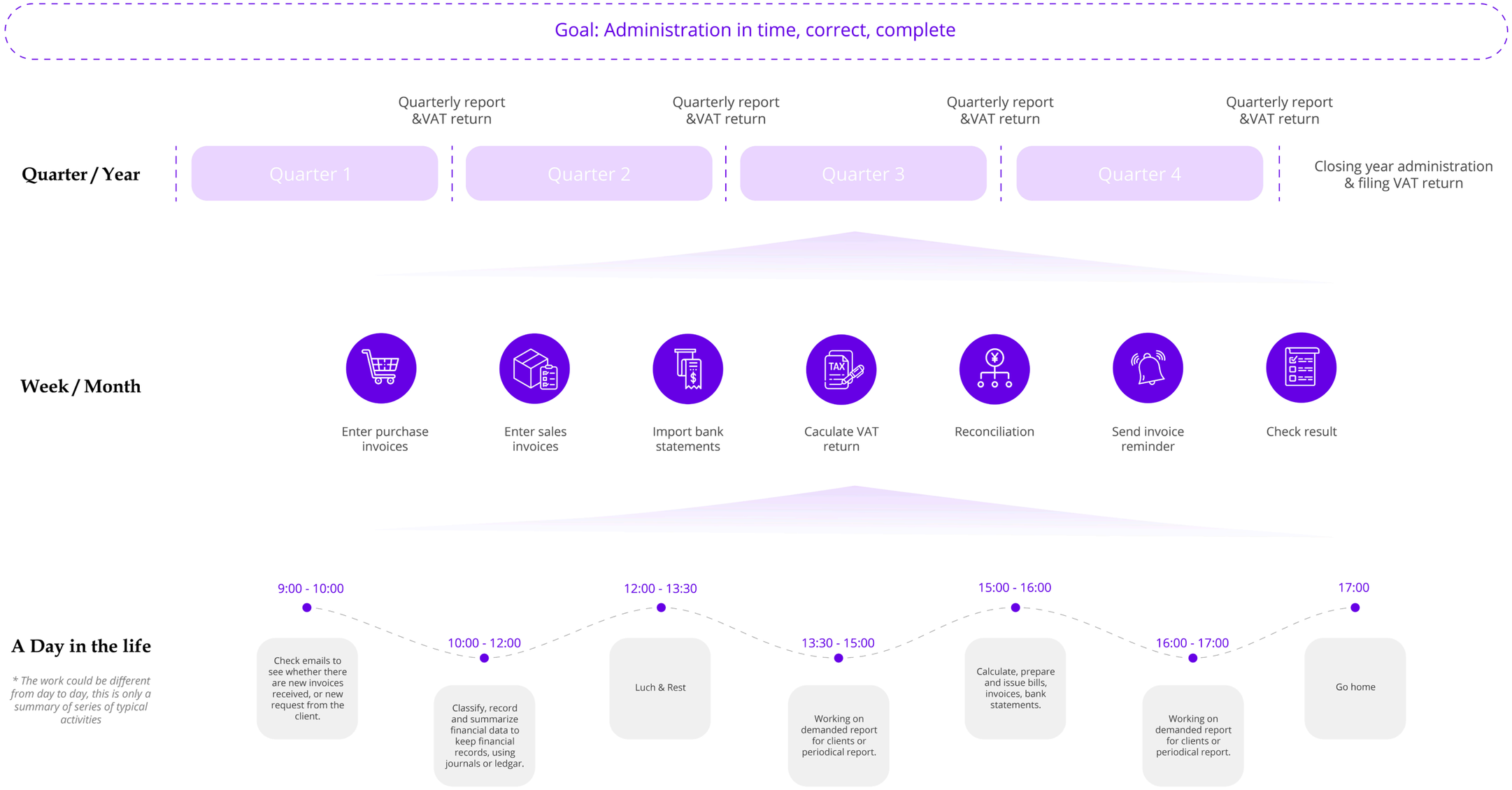



*Figure 4.2: The customer journey of bookkeeping*

Aligned with other financial administration work, bookkeeping normally has a quarterly cycle and yearly cycle to create financial report or be prepared for tax calculation. Many bookkeepers also hold the habit to finish bookkeeping monthly or weekly in order to have an up-to-date financial records. Their daily work includes entering purchases invoices, entering sales invoices, importing bank statements, calculating VAT return, reconcilation, sending invoice reminder and checking the result. But the order of these tasks is not determined in real situation. At the bottom of figure 4.2, a day in the life of a bookkeeper is described. Since the work could be different from day to day and individual to individual, this is only a representative schdule of bookkeepers. They start their day with checking emails to see whether ther e are new invoices received, or new requests from clients. At 10:00 to 12:00, they may be classify, record and summarize financial data to keep financail records, with using journals or ledgars. In the afternoon, they could work on the demanded report for clients or the periodical report. Or they will calculate, prepare and issue bills, invoices and bank statements. After a day of work, they will go home and enjoy their evening.

***The habit of checking the new invoices or demands in the morning gives inpiration to a "daily update" function the final design (chapter 09).***

# 4.2 Internal Analysis

*This section gives more context information about company strategy of AI, the existing AI functions, as well as the problems in the development process.*

### 4.2.1 Interview with internal stakeholders

To know more about the Exact's strategy and implementation towards AI and automation, a round of internal interviews is applied. Two interviewees are recruited. One is a product owner who has been working in Exact for more than twenty years and is in charge of the automation of bookkeeping. The other one is a data scientist who has been in Exact for two years and now also takes part in the development of the AI features. The following sections will introduce the main findings from the interviews. The original excerpt of the interviews could be find in Appendix 1.

### 4.2.2 AI Strategy

The strategy within Exact to implement AI - empowered accounting is called "No-Hands Accounting" or "Robotic Accounting". This strategy starts from 2017. At present, the strategy is focused on developing automatic financial administraton. In the next step, Exact will add more functions about predicting financial status and generate business insights (Figure 4.3).

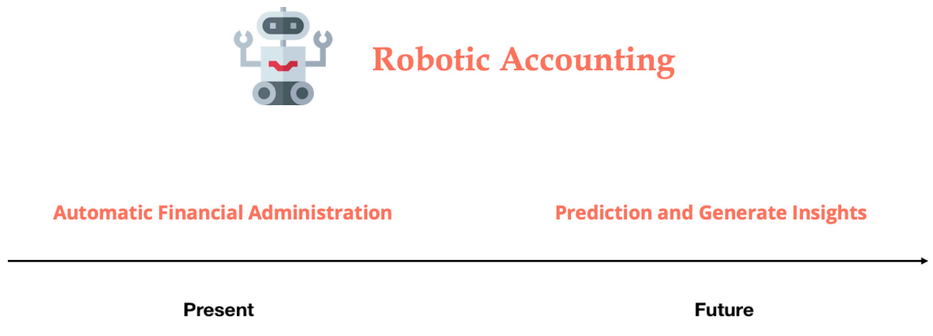



*Figure 4.3: Strategy of Robotic Accounting*

### 4.2.3 Automatic Functions

Now within Exact Online, there are two main automatic functions.

#### Invoice Allocation (Scan & Recognize)

Automatic Invoice Allocation means the digitalization and automatic recognition of invoice. Use digital invoice, or digitalize paper invoices and receipts by Scan & Recognize. Then the robot will recognize the items automatically and divide the items of the invoice into VAT codes or categories.

Figure 4.4 shows the technical process of how Invoice Allocation works. First, the user uploads a picture of the invoice to Exact Online, or a digital invoice is sent directly from PEPPLE (a ditial banking service) or API digital mailbox to Exact Online. Then the invoice document will be sent to the third party for recognition of the text. After the related information is extracted from the invoice, a

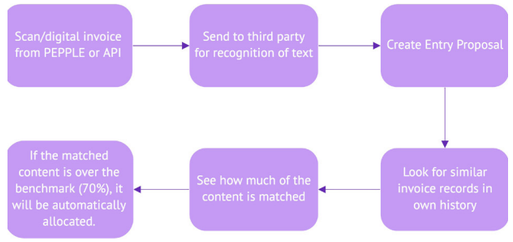



*Figure 4.4: Technical process of Invoice Allocation*

entry proposal will be created. Then the AI system will search in the history invoice records to look for similiar entries and see how much of the content is match. When the matched content is over the benchmark (70%), this entry will be automatically allocated.

#### Bank Allocation

Automatic Bank Allocation means that bank transactions are automatically identified, then they will be added to your administration on a daily base. The robot recognizes them, books them on the correct ledger account and also processes the differences.

Figure 4.5 shows the technical process of how Bank Allocation works. First, after the bank account is linked to Exact Online, the system will automatically extract the transaction information. A entry proposal will be created based on the information. Then the AI system will look for similiar bank transactions in the history. If the new proposal matches more than 70% content with a previous transaction, a suggestion or direct allocation will be made. And if an invoice record is found to have an equal amount of money with the bank transcation, the system will link these two entries for the reconcilliation.

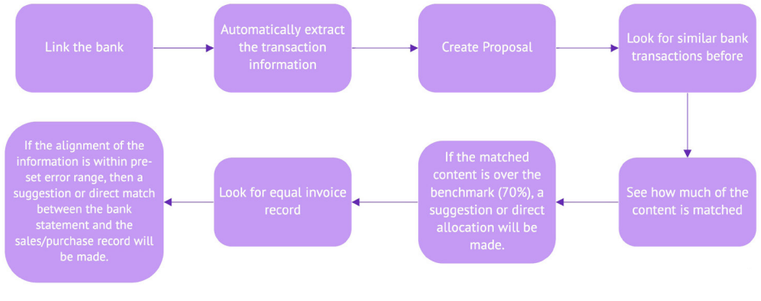



*Figure 4.5: Technical process of Bank Allocation*

### 4.2.4 Development of AI

When reflecting on the development status and process of Exact Online with the interviewees, the following findings are inpirational to guide the design direction:

1.In the existing process, there is little consideration about trust before developing AI features.

2.Due to the time limitation, sometimes AI functions may be released too early before it is mature enought to establish trust .

3. Since the Exact Online is a very mature product, now the AI services are only add-ons to the existing product and workflow. This may lead to an inconsistant experience of the AI services.

Thus, when developing AI services, it is important to change the mindset from "adding new features to the product" to "design for an **AI-based workflow of bookkeeping**". What's more, since the AI strategy is just at its start, there are more AI features are going to be developed. So **a guideline** should be integrated in the develop process to facilitate the trust - building for the AI features.

### 4.2.5 Product Analysis

To get the first-hand experience about the automated workflow within Exact, a product analysis is conducted.

#### Product Safari

Product Safari is a variance from the service design method "Service Safari". The idea is to try the product or service in the real context with the aim to understand the service better and experience as a user rather than a service or product provider.

In Service Safari, the participant should take pictures to capture the moment he or she wants to reflect on. In this case, screenshots of the software are made instead of taking pictures (Figure 4.6)

#### Experience of the Product

From the Product Safari, these touchpoints are being reflected by the author to identify opportunities to improve trust:

**Homepage**
- Lack clear notification of automated tasks
- Lack of insights and reasons why to turn on other automatic functions.

**Scan & Recognize**
- The scan service is separate from createing new invoices, which may reduce the chance for a user to try it.
- Little clue about how the invoice is processed, when it would be finished and why it goes wrong.
- "Ready to enter" looks like it's 100% correct, which is actually not the right intepretation.
- Can't identify which are automated proposals or manual proposals.

**Bank Allocation**
- Nice that it has explaining information about who processes it, but it's not very easy to read.
- When turn on the full automation setting, there is little clue about what transactions are being automated booked.

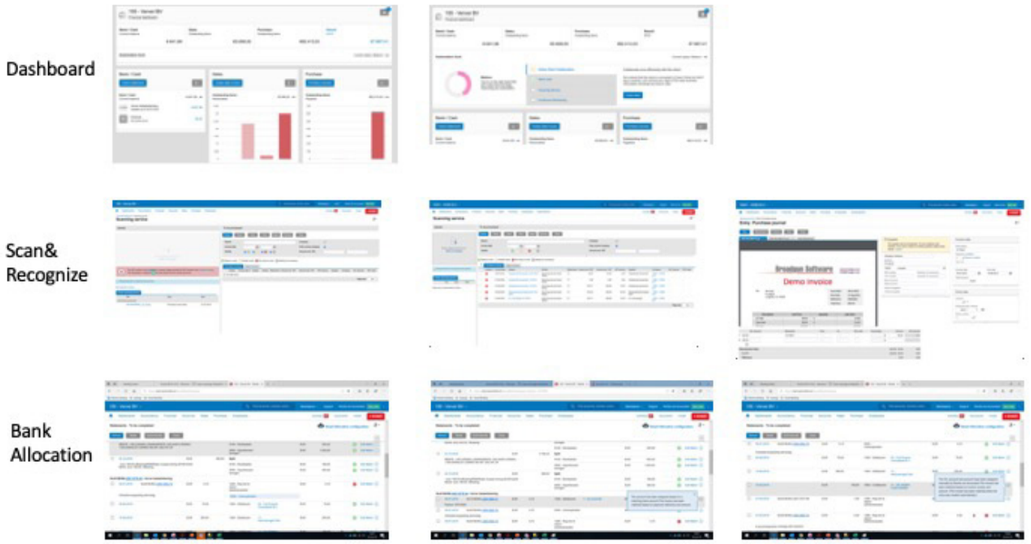



*Figure 4.6: Screenshots made during Product Safari*



## Key Takeaways From Chapter 04

1. The bookkeeping work contains the following tasks: enter purchases invoices, enter sales invoices, import bank statements, calculate VAT return, reconcilation, send invoice reminder and check the result.

2. Many bookkeepers have the habit to check new invoices, transactions or emails in the morning.

3. There are two main AI functions now in Exact Online, one is Invoice Allocation, and the other one is Bank Allocation.

4. When designing for AI, the developers should change the mindset from "adding AI to the exsiting workflow" to "build the new workflow based on AI".

5. A guideline for buidling trust is needed to facilitate the developers to design a trust-worthy AI function.

*Chapter 05*

# User Research

This chapter will introduce the two rounds of user research and the research results. We will start with the quantitative research and then the qualitative research. Both the set-up and the results will be shown.

# 5.1 Goal and Approach

*This section describes the aim, goal and approach of the whole user research.*

## 5.1.1 Aim

The model of trust formation has given a clear structure of theoretically how different elements will have an impact on people's trust towards AI. It is important to link it back to the real user experience through user research and see how the theory applies in the specific context of automatic bookkeeping. Based on the research results, user insights could be collected to identify design opportunities and design requirements.

It is worth to mention that though the trust formation theory is a good starting point to reveal the reasons behind the challenge, it only focuses on a narrow definition of "trust", which might be considered as a limitation in this project. This is because when AI application developers talk about the trust issue with AI, most of the time, it is built on the concern of low adoption of AI. So the user research should also explore other factors that might have an influence on a broader definition of "trust" that consists of the aspect of adoption.

## 5.1.2 Goal & Questions

In conclusion, five main research goals are set up:

**1. Emphasize with the target users of Exact Online**

**2. Analyze the external elements of trust formation towards automatic bookkeeping**

**3. Analyze the internal elements of trust formation towards automatic bookkeeping**

**4. Explore other elements that will influence the trust towards automatic bookkeeping**

**5. Identify design opportunities**

After further development of the research goals, the following research questions are being proposed:

• Define the user profile

• What is the current way of bookkeeping with Exact Online

• How do users trust AI in Exact Online

• What are the elements that will influence the users' trust towards AI in Exact Online

• Which elements have the most significant impact and are more interesting to look into

• What are the potential touchpoints to improve the trust

• From the user perspective, what is the expected role of automation

According to the research questions, one qualitative research and one quantitative research are conducted.





# 5.2 Quantitative Research

*The research goal, set-up as well as the results of the quantitative research is shown in this section.*

## 5.2.1 Research Goal

First, to create an overview picture of how Exact Online users trust the automatic features within the product and the reason behind it, an online questionnaire survey is applied. This survey uses the framework from the trust model (chapter 3.2) to describe the trust of users. The quantitative results could answer the following questions:

• How much does the user trust the Exact Online AI functions

• What elements from the model will have an impact on users' trust towards AI in Exact Online

• How will the user evaluate these elements in the context of Exact Online

• The ranking of these elements based on their evaluation result and their importance

## 5.2.2 Research Set up

An online questionnaire is designed to reach enough users for quantitative analysis. The questionnaire structure is displayed in Figure 5.1.

The questionnaire consists of five parts. Firstly, basic information like age and position of the participants are collected to describe the target users. Then participants are asked to evaluate some general items including external elements and purpose elements selected from the trust-formation model. After that, important internal elements (performance elements and process elements) are displayed to be evaluated for the two automatic functions as well. The statements about the elements are extracted and modified

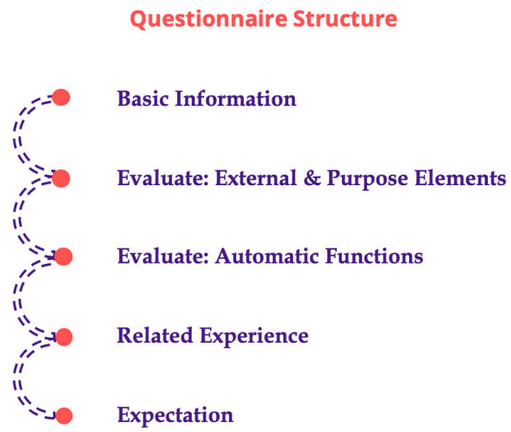



*Figure 5.1: Screenshots made during Product Safari*

from Körber's questionnaire to measure trust in automation (Körber, 2019). Each statement stands for one element. A 7-point Likert Scale is used for the evaluation of these statements. As a supplement to the statistics, open questions on related experience about trust in automation and expectation for the automatic bookkeeping are asked in the last two parts of the questionnaire. The full questionnaire can be found in Appendix 2 (both the Dutch version and the English version).

The questionnaire is distributed online by sending links to Exact Online users.(Figure X) Before send the survey to real users, two pilot tests are done with the researchers from Exact to check the expression and improve the reliability of the questionnaire.

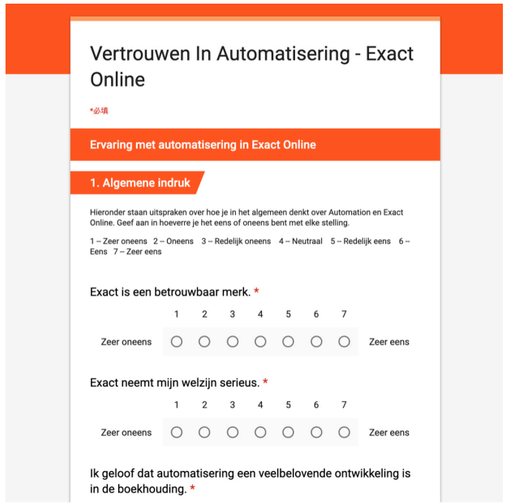



*Figure 5.2: Screenshot of the online questionnaire*

Finally, 36 valid responses are collected from the online survey. The respondents are well distributed in the three different types of users from Exact Online, with 13 accountants/bookkeepers from the accountancy, 11 accountants/bookkeepers work in-house and 12 entrepreneurs who have their own business (Figure 5.3).

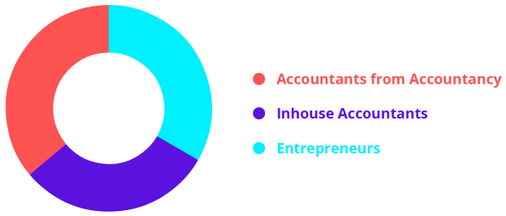



*Figure 5.3: The donut chart of responses from three different types of users*

**Example of elements and the corresponding statement**
(Take Invoice Allocation as example)

**Situation Interpretation**
*Automatic Invoice Allocation is capable of interpreting the situation correctly.*

**Usefulness**
*Automatic Invoice Allocation improves the quality of my performance.*

**Efficiency**
*Automatic Invoice Allocation makes me accomplish tasks more quickly or easier.*

**Ease of Use**
*The process to use Automatic Invoice Allocation is user-friendly.*

**Clearness**
*The state of Automatic Invoice Allocation is always clear to me.*

**Predictability**
*Automatic Invoice Allocation reacts predictably.*

**Understandability**
*I understand how Automatic Invoice Allocation works.*

**Mistakes**
*The Automatic Invoice Allocation could make mistakes.*

**Mistake Acceptance**
*The mistakes of Automatic Invoice Allocation is unacceptable.*

** When a certain element is asked in a negative way, the score will be reversed in the analysis.*

*Figure 5.4: Examples of elements and their corresponding statement in the questionnaire*

## 5.2.3 Quantitative Result

Data analysis methods (correlation analysis and regression analysis) are applied to process the qualitative results from the questionnaire. To later on interpret the result, some examples of elements and their corresponding statements in the questionnaire are explained in Figure 5.4.

The original data analysis result from SPSS could be found in Appendix 3. Some main insights from the qualitative results are addressed below.





### Environmental influencers on trust

Attitude: Embracing AI

In general, Exact Online users think that AI is a promising trend in bookkeeping (with an average score of 6.2 out of 7), and they expect a wider range of automation in financial administration. And the people around them are also positive about automation. When compare cross the three types of users, the entrepreneurs show the most open attitudes towards automation. In the meantime, the accountants from accountancy seem to be most reluctant, while the three respondents that think automation would be a threat are all from this group.

Trustworthy brand, better execution is needed

Exact has a good reputation establishes a trustworthy brand image among the Dutch users. However, when asked about whether users think Exact takes their well-being seriously, the score is relatively low. This might be due to the fact that the development process is kind of low within Exact. The users feel that some expected features are not picked up immediately. One user mentioned in the open question that things are "nicely conceived, poorly executed".

### How do users trust now?

In the questionnaire, the statement "I feel confident to rely on Automatic Invoice / Bank Allocation" represents the user's propensity to trust. Figure 5.5 shows the "trust" scores of these two automatic functions. While "4" stands for a neutral score, the Invoice Allocation (IA) is cored 3.95 and the Bank Allocation is scored 4.65. We could indicate from the result that both Automatic Invoice allocation and Automatic Bank Allocation (BA) are still not yet to be fully trusted by users. When compared with each other, users trust the Automatic Bank Allocation better than the Automatic Invoice Allocation.

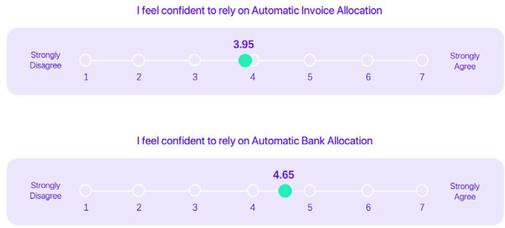



*Figure 5.5: The score of trust towards the two automatic functions*

### What are the trust elements that need attention?

Figure 5.6 shows the evaluation results of trust elements when users are using Invoice Allocation and Bank Allocation. Though Bank allocation is trusted more and used more than Invoice Allocation, when compares with each other,

For Automatic Invoice Allocation (IA)

| Item | Situation Interpretation | Usefulness | Efficiency | Ease of Use | Clearness | Predictability | Understandability | Mistake Acceptance |
|---|---|---|---|---|---|---|---|---|
| Mean Score | **4.7368** | **4.6842** | 5.6316 | 5.0000 | **4.3158** | **4.5789** | 4.8947 | **3.5263** |

For Automatic Bank Allocation (BA)

| Item | Situation Interpretation | Usefulness | Efficiency | Ease of Use | Clearness | Predictability | Understandability | Mistake Acceptance |
|---|---|---|---|---|---|---|---|---|
| Mean Score | **5.1290** | **5.2581** | 5.6452 | 5.5161 | **4.7097** | **4.8387** | 5.8065 | **3.9032** |

*Figure 5.6: The score of trust elements of the two automatic functions*

the outcomes of these elements from the two functions show a similarity. **Mistakes, Clearness, Predictability, Situation-Interpretation and Usefulness** are the top five items there are scored lower than the other items, while **Mistakes, Clearness and Predictability** are the three items that received the lowest evaluation.

### How these elements matter?

Are these elements going to influence how users trust the function? A **correlation analysis** is conducted to see the relationship between different items and people's propensity to trust.

Figure 5.7 shows the result from the correlation analysis of the elements and trust. When the value of sig is at the level of 0.01 (<= 0.01), there is a significant correlation between the element and trust. For Invoice Allocation, it is showed in the chart that **Situation-Interpretation, Usefulness, Predictability, Mistakes and Mistake-Acceptance** have significant correlations with Trust. For Bank Allocation, **most of the items (except Understandability and Mistake Acceptance)** have significant correlations with Trust.

The Understandability does not have a significant correlation with Trust in both Invoice Allocation

For Automatic Invoice Allocation (IA)

| | | Situation Interpretation | Usefulness | Efficiency | Ease of Use | Clearness | Predictability | Understandability | Mistake | Mistake Acceptance |
|---|---|---|---|---|---|---|---|---|---|---|
| Trust | Sig.(2-tailed) | **.006** | **.008** | .373 | .473 | .440 | **.002** | .410 | **.010** | **.004** |

For Automatic Bank Allocation (BA)

| | | Situation Interpretation | Usefulness | Efficiency | Ease of Use | Clearness | Predictability | Understandability | Mistake | Mistake Acceptance |
|---|---|---|---|---|---|---|---|---|---|---|
| Trust | Sig.(2-tailed) | **.000** | **.000** | **.006** | **.000** | **.000** | **.000** | .113 | **.037** | .135 |

*Figure 5.7: Result from correlation analysis of the elements and trust*

Two Models of Trust from Regression - Coefficients

| Model | | Unstandardized B | Coefficients Std. Error | Standardized Coefficients Beta | t | Sig. | 95.0% Confidence interval for B | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Lower Bound | Upper Bound |
| 1 | (Constant) | 4.38 | .164 | | 26.742 | .000 | 4.051 | 4.709 |
| | **Predictability** | .823 | .116 | .715 | 7.089 | .000 | .589 | 1.056 |
| 2 | (Constant) | 4.380 | .153 | | 28.607 | .000 | 4.072 | 4.688 |
| | **Predictability** | .621 | .130 | .540 | 4.780 | .000 | .360 | .883 |
| | **Usefulness** | .389 | .138 | .318 | 2.816 | .007 | .111 | .668 |

*Figure 5.8: Models generated from Multiple linear regression*





and Bank Allocation while Predictability has a significant correlation. We could indicate that **the users want information that could help them to predict the outcome of AI function, but they do not need too much explanation about the complex mechanism.**

Multiple linear regression is applied in order to compare the influence of different items. From Figure 5.8, we could see that two models are established, one is related to Predictability and the other one is related to Predictability and Usefulness. The other elements are all excluded when creating the model. Thus, it is obvious that **Predictability has the biggest impact on trust** towards automation within Exact Online. Besides, **Usefulness is also an important element to consider when compared to other elements.**

## 5.2.4 Conclusion

According to the analyze from the questionnaire, the Predictability might be the most interesting problem to look into, since the current predictability of the automation in Exact Online receives negative evaluation and shows a strong impact on users' trust.

Though the Usefulness could not be changed without the improvement of algorithm, Exact could show the Usefullness to convince the users. Whant's more, Mistake as the counterpart could be considered more in design. Mistakes are inevitable in AI in the early stage, as it is a self-learning process, especially when the technology is not mature enough. How should designers deal with the mistakes when it happens to eliminate its influence on trust?

Besides, the automation should prove its "smartness" by correctly interpreting the situation that the user is facing (Situation-Interpretation). In the same time, the automation should display enough information to clearly show the current state of its process (Clearness) and give users a feeling of control.

Thus, four topics could be concluded from the results: **Show Ability, Mistake Management, Explainability & Transparency and Interpreting.** The first three have a higher weight than Interpreting. And Among these four topics, **Explainability & Transparency is the most interesting topic to look into.**

The result from the open questions will be discussed and analyzed together with the qualitative research result in the next section.

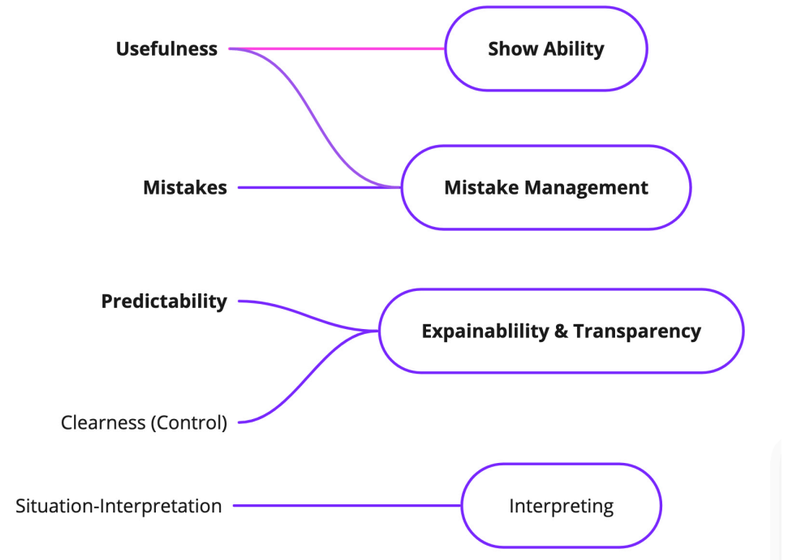



*Figure 5.9: Main topics concluded from the quantitative research*

# 5.3 Qualitativ Research

*The research goal, set-up as well as the results of the qualitative research is shown in this section.*

## 5.3.1 Research Goal

The quantitative research creates a statistical overview of how users trust AI in Exact Online, and how they evaluate the elements related to trust. But the result is constrained within the literature, and elements lack explanation. What's more, the questionnaire results may miss the personal perspective and context information. Hence, an explorative in-depth qualitative research is applied to give immersive insights about the real context and explore more potential influencers on trust. The qualitative research results could answer the following questions:

• What are the workflow and the working habits of bookkeepers?

• How do users ecperience with AI in Exact Online now?

• What are the elements that will have an impact on users' trust towards AI in Exact Online?

• Besides the elements from the theory, are there other elements that will influence the trust towrds AI in Exact Online?

• How to intepret and understand these elements in real context?

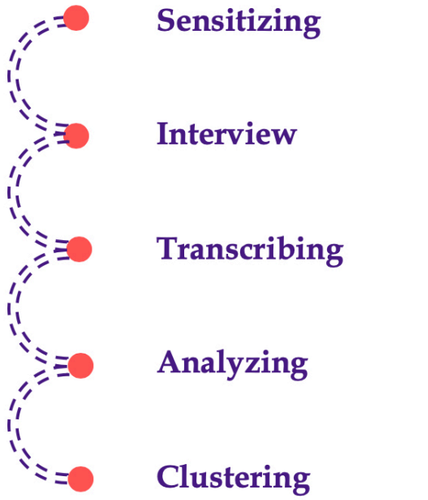



*Figure 5.10: Structure of the qualitative research*

## 5.3.2 Research Set up

The qualitative research is a semi-structured interview combined with context mapping tools. Figure 5.10 shows the structure of qualitative research. In the beginning, a sensitizing booklet is handed out to the participant. During the participant filling the booklet, an interview is conducted according to the answers the participant gives to the booklet, so the latent need behind the answers could be discovered. The structure of the sensitizing booklet follows the experience domain (Sanders, 2001): it starts from the present feelings, then goes back to past experience, and in the end dream about the future expectation (Figure 5.11). The full sensitizing booklet could be found in Appendix 4.

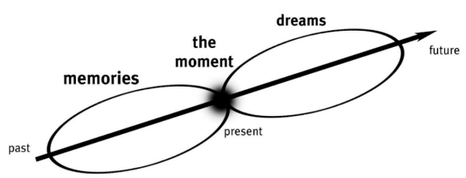
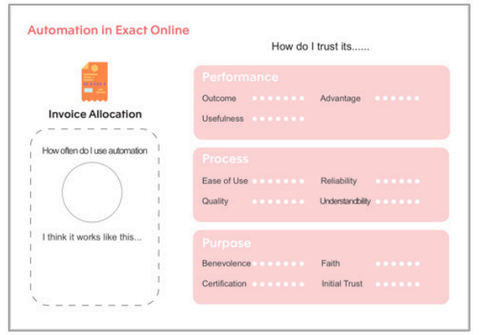
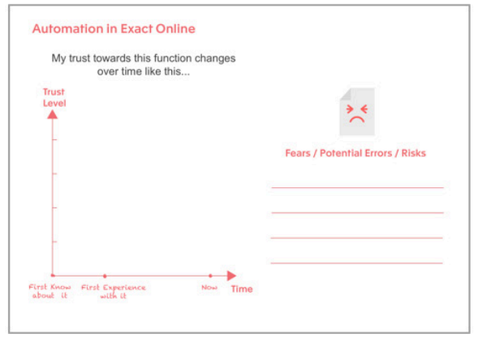



*Figure 5.11: The experience domain (Source: Sander)*



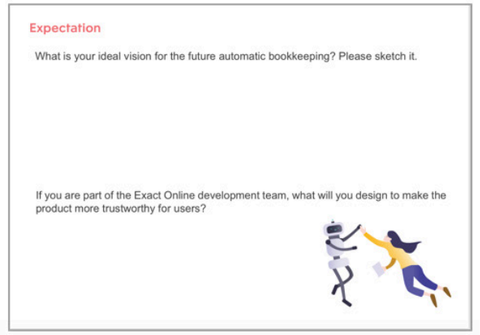




*Figure 5.12: Example pages of the booklet*

Seven interviewees in total participated in the research. Three types of main target users (external accountants/bookkeepers, internal accountants/bookkeepers, and entrepreneurs) are covered by recruiting two accountants from the accountancy, one in-house accountant, and two entrepreneurs. And two pilot accountants from the No-Hands Accounting Lab (users who are willing to try new automatic functions before officially released) are interviewed in order to give expert opinion about the topic. Each interview takes about one hour.

*Figure 5.13: An interviewee filling the booklet*

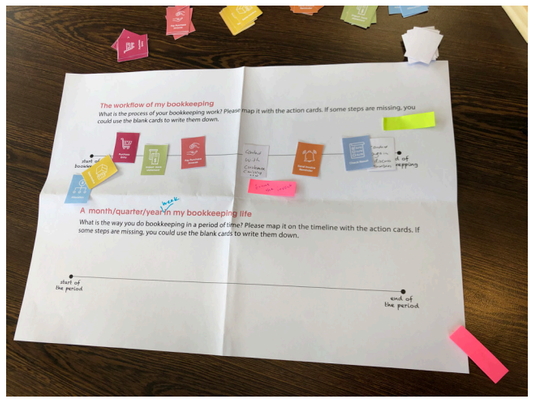



*Figure 5.14: Part of the filled booklet*

## 5.3.3 Qualitative Result

After all the interviews are transcribed, line-by-line coding is done to transform the raw data into insights. Combined with the open questions from the questionnaires, insights are then clustered and merged to main findings. Figure 5.15 and Figure 5.16 show the clustering process.

Figure 5.14: Cluster insights from interviews

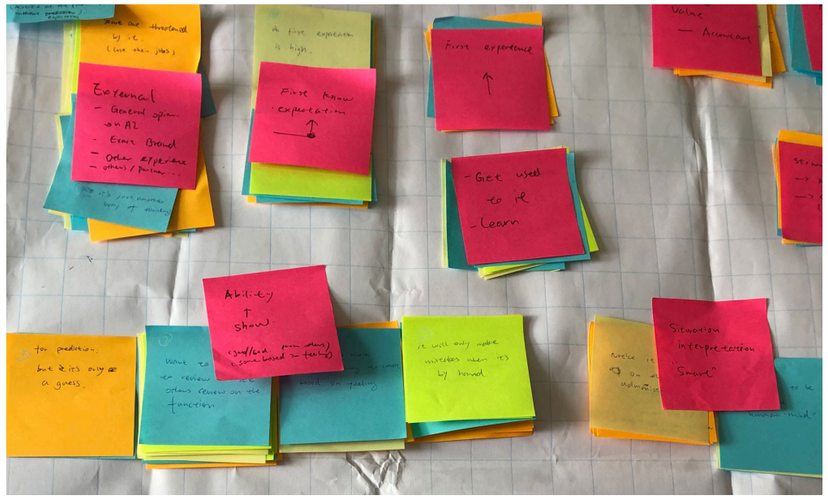



Figure 5.15: Group insights from interviews

The main findings from the clustering will be discussed in the following sections. Figure 5.16 shows an overview of the insights structure.





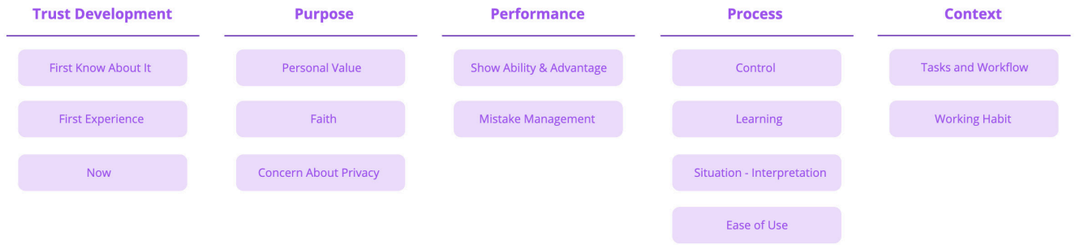



Figure 5.16: Overview of the insights from clustering

## 5.3.4 Trust formation pattern

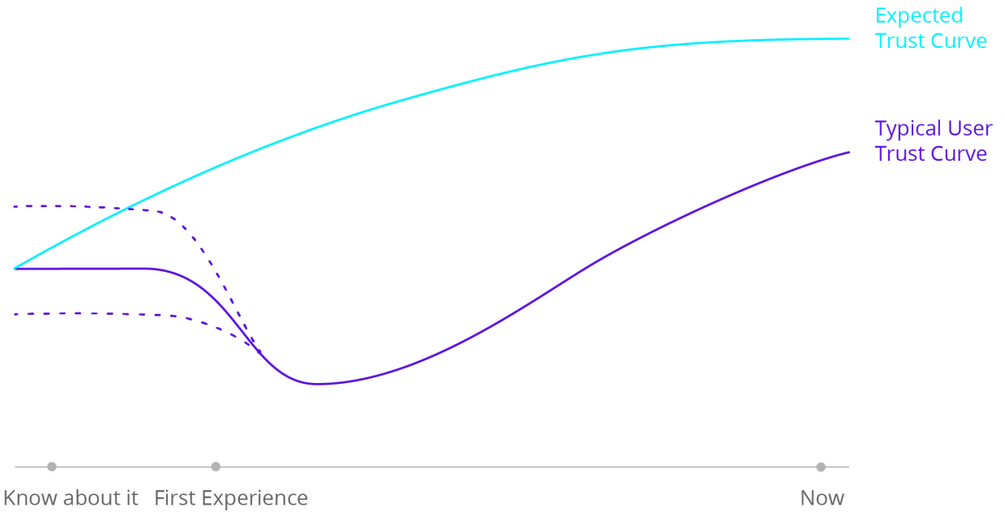



Figure 5.17: The typical trust formation pattern from users compared with expected pattern

When the question "how your trust changes over time" is asked, a similar pattern could be identified according to the answers. Figure 5.17 shows a visualization of this pattern.

Ideally, the trust should calibrate with how AI capability gradually develops from the data (the blue line in the graph). But the real trust experience of users is not aligned with the expected curve. The purple curve represents for this typical trust formation pattern from users. (Note: This typical pattern should be seen as a summary of insights rather than a universal development process that suits the situation of every user.)

### First know about automation

At this very beginning phase, the trust could differ for each user because the environment and personal factors will largely influence it. For example, previous related experience with similar AI features could have an impact on the initial trust. An interviewee said he didn't trust automation in Exact Online at first because he used another accounting software that has bad automatic functionalities, so he doesn't think Exact could perform better. Even the unsatisfying experience with automation in other industries could lead to distrust for automation in Exact Online, such

as a fail automatic recognition of information on the passport at the airport. On the other hand, sometimes a wrong expectation of the machine ability could also lead to overtrust for automation in Exact Online.

### First experience with automation

Most users from the interview experience with a trust fall when they first experience with the automatic functions, because the AI function doesn't perform well enough to their expectation. Some of them still give it a chance and keep trying it, the others just return to their manual way of working until some hard situation like a busy week with a lot of invoices to process.

### And now

For the users who keep using the automatic functions, the trust gradually increases. They feel that the automation is getting better and better, so their trust goes up with the automation capability and believes that it will keep improving.

## 5.3.5 Elements that will influence the trust formation

From the result, most of the elements could be classified into the three trust bases: purpose, performance, process. Additionally, some other elements that are not directly linked with trust and could not be assigned to the three categories, but they still could influence the trust in some way. They are classified as "trigger".


### Personal Value

The fundamental reason why users would trust an automatic application or not is whether they find it is out of the purpose to fulfill their personal value. Users who are positive about the automation thinks that it can help them achieve their value. Figure 5.18 shows the different personal values of entrepreneurs and accountants/ bookkeepers. As for accountants, they see their value lies in the communication with their clients, while they are providing financial insights and becoming more of an advisor. One accountant said that with automation, he could "work with his client" rather than "for his client". And for the entrepreneurs, their passion is in their business, so the value for them is automation could give them a more up-to-date overview of how their business is doing.

### Faith

Entrepreneur

*"My aim is to continue to see an overview."*

Accountant

*"it makes it really easy to work with your customer instead of for your customer."*

*Figure 5.18: Personal value of entrepreneurs and accountants*

The faith about whether AI functions will get better will also influence their trust towards AI. Those who feel progress has been made with the automation in Exact Online and believe it will keep improving are more tolerant of the mistakes and shows a higher trust. One said that if he knows that the mistakes will finally contribute to the improvement of AI, he is willing to see mistakes happen. Another interviewee explained this by making a metaphor:

*"In Dutch, it's 'a child's disease', you know it happens, you have to go through it, everybody does. And I felt like well that's probably this as well it's just as child disease, get through it, and really starts getting better."*





### Concern About Privacy

The core of AI in Exact Online is to learn from data. So while using the automatic functions of Exact Online, users are aware that their data is being collected. The entrepreneurs think that company data is precious and are worried that it will be hacked. What's more, some users are concerned about how Exact will use these data, which might be influenced by the bad reputation of big companies abusing user data, such as the Facebook user data leakage (Figure 5.19).

*Figure 5.19: Facebook user data leakage*


### Show Ability and Advantage

One of the biggest reasons why users trust the automatic function is that they feel the automation is useful and really helps them to be more productive in their work. Those who find automation saves them time have a higher trust on it, and those who feel the immature of automation causes them more time to correct all the results show a lower trust on it. On the other hand, demonstrate the ability could also help users to establish an appropriate trust. It is essential to show the ability to convince users to use automation and let them know what to expect.

### Mistake Management

For AI functions, it is not easy to avoid mistakes yet. Especially at the very beginning phase of AI when more data needs to be collected and the AI model is not accurate enough. If the mistakes cause a bad influence on the result which offsets the benefit that AI function could achieve, then the decrease of trust will happen.

An interviewee mentioned that when he sees a "green flag" showed behind the invoice proposals created by AI, he thought it meant the proposal was correct while it actually only meant it was completed, and he spent a lot of time to check the result and correct the mistake when he finally found out what happened. Also, sometimes automation would make repetitive mistakes, he found it annoying that he needed to fix them one by one.

To eliminate the negative impact of mistakes, how to deal with the mistakes should be considered. The following four topics are the main directions to think about:

**1. Reduce mistakes**
How to reduce the mistakes in the outcome?

**2. Identify mistakes**
How to identify mistakes in an early stage?

**3. Easy correction of mistakes**
How to make it easy for users to correct mistakes?

**4. Query support**
If the mistake is hard to deal with, do we have good query support?


### Control

The missing of control is mentioned a lot in the interviews as well as the questionnaire that causes the distrust for automation. But what does "control" mean? It actually has different layers: For the entrepreneurs, they want always to know what is happening with their business, so when things are automatically processed, they

lose the clue of how their business is doing. For accountants, because they have a high standard for their outcome, they feel they always need to double-check whether there is something wrong, so they can stay in control for the quality of the result. For both of them, knowing how things are being processed by automation would give them more control and establish appropriate trust on the result. Control is strongly related to the topic "Explanability & Transparency" from the quantitative research.

### Learning

People have the inertia to stay in their old way of working. When a new way of working appears, they need to learn about the new process. Especially for the Exact Online users, many accountants are from the generation where they start bookkeeping with paper and sheets. They are so used to their old habits and are may not be willing to spend more time to study the automatic process. If there is an easier and smoother approach for users to get used to the new process, they will show higher trust because they could understand it better.

*"We have to learn that we can trust automatic services."*

One interviewee said.

### Situation Interpretation

A trustworthy AI application is expected to be "smart", but at this moment, the automation in Exact Online is still more in the phase of "crunching numbers". The outcome sometimes does not consistent with the real situation that the user is facing. For instance, it will mistakenly create multiple supplier name for the same company. These misalignments between how AI interprets and the real situation will make users more suspicious about AI's ability and trust it less. To overcome this obstacle, more testing and user research should be conducted to get more insights about what happens and what does it mean in the real experience of users.

### Ease of Use

Though not directly related to AI ability, the ease of use will also influence trust. When the user goes through bad user experience, the unsatisfactory will be passed to trust for the AI function. An interviewee complained about the user-friendliness of the cockpit from the product that he could not easily find the right information he wants.


### Challenge

In the trust formation pattern introduced in 5.3.4, there is a changing point after the users experience with a trust fall that their trust begins to go up again. When asked about what made them change their attitude and start to use the automatic function again, their answers were quite similar: it was the week that they were too busy to do everything manually or there were tons of entries to be processed. That's when they decided to give automation another try and at the end found it actually solved their problems. So a challenge the user is facing could be an opportunity for AI to show its value and win the trust.

### Fun

One fact is that not many people enjoy doing manual work, especially for the entrepreneurs whose main job is not about financial administration. An entrepreneur interviewed find it is more fun to do the automation rather than manual entering.

*"If it just clicks clicks clicks and then you press ok, that's fun. If you have a whole pile of papers, oh yeah, that's not fun."*





## 5.3.6 Personas

The context mapping and interview give a lot of information that could help us empathize with users. The insights about the workflow are synchronized with the findings from the internet into the customer journey from in chapter 4.1.2. And the insights about users' motivation and working habits are mapped into the two following personas.

From the personas, we could see the differences between the entrepreneur and the accountant that might influence the design of AI services:

1. For entrepreneurs, AI should support their passion for business by giving them insights about their business and taking care of the rest. For accountants, AI should support them to transform to "business advisors".

2. Entrepreneurs are more open to using AI while accountants are more conservative and cautious. So accountants may need more participation in the AI decision-making, they also need more time to get used to the new way of working.

3. Entrepreneurs prefer to administrate their finance in a mobile and fee way while accountants normally work in the office.

Ron
Entrepreneur

*"My aim is to continue to see an overview."*

**Age:** 40

**Financial Background:** Has little knowledge about finance.

**Task:** Doing the input of invoices

**Attitude towards automation:** Think automation is a must

**Contact with Exact:** do not contact directly with Exact, mostly via his accountant.

**Goal:** To know how is his business doing.

**Experience with the automation in Exact Online:** Ron is the owner of a new media company. He run the company together with 3 employees. He have an external accountant to help him with analyze how his business is doing and calculate tax. But he will do the invoice inputting himself. For him the bookkeeping is not his main interest, and he wants to do it in a more mobile way so that he could do it immediately when he get the invoice or when he is laying in his couch in the evening.

*Figure 5.20: Persona of the entrepreneur*

Richard
Accountant

*"it makes it really easy to work with your customer instead of for your customer."*

**Age:** 50

**Financial Background:** Professional in finance.

**Task:** Make financial report, give tax advice, interpret financial status

**Attitude towards automation:** Automation is a promising trend in accounting, but it's still in its infancy.

**Contact with Exact:** Contact directly with Exact sales people.

**Goal:** To make accurate report, to give insights to customers.

**Experience with the automation in Exact Online:** Richard is an accountant from accountancy. He helps clients with their finance. Everyday he works with the numbers and periodically report to his clients and talk about how their business is doing. He thinks automation could help him to work more efficiently, but still he sees a lot of mistakes. He also feel it's hard to change his old way of working.

*Figure 5.21: Persona of the accountant*

# Key Takeaways From Chapter 05

1. Two rounds of user research are conducted: quantitative research and qualitative research. For the quantitative research, we use the trust framework from literature to create an overview of how these elements influence users from Exact Online and how important they are. For qualitative research, we could understand these elements better with real experience and explore more elements that might impact trust. More context information is also gained from qualitative research.

2. Trust is a dynamic process and it could change with time. A typical pattern is found from Exact Online users: they may experience a “trust fall” when they first experience with Exact Online AI service, but then it gradually goes high with recognizing the performance is improving.

3. The elements that will influence trust could be classified into four categories. These categories are Purpose, Performance, Process and Trigger. An overview of the elements in each category is displayed below.

Purpose: Personal value, Faith, Concern about privacy

Performance: Show ability & advantage, Mistake management

Process: Control, Learning, Situation Interpretation, Ease of Usse

Trigger: Challenge, Fun

4. According to the qualitative research, Show Ability, Mistake Management, Explainability & Transparency and Interpreting are the four most important topics to consider. Show Ability, Mistake Management, Explainability & Transparency might be more basic, so they have a higher priority than interpreting. And Explainability & Transparency is the most interesting direction to be considered, since it has the biggest impact on trust.

*Chapter 06*

# Strategy & Requirements

A strategy pyramid is formed for Exact based on the findings in the last chapters. In this chapter, we will talk about the strategy pyramid. We start with the introduce the structure of it: vision, strategy, tactical layer and operationalization. Then each layser will be discussed seperately. For the tactical layer and operationalization layer, design requirements will be addressed.

# 6.1 The Strategy Pyramid

## 6.1.1 Introduction & Overview

In the last chapters, insights are generated from both the context and the users. How to apply these insights to the development of Exact Online AI features? According to this question, a strategy pyramid is created.

The strategy pyramid is derived the strategy design structure which is proposed by Holloway, M. (2019). This structure aims to create an implementable strategy. Thus the strategy pyramid will cover both high-level layers like vision and strategy or low-level layers like tactical layer and operationalization.

Figure 6.1 shows an overview of the strategy pyramid of this project. And in the following sectors, each layer of the pyramid will be explained.

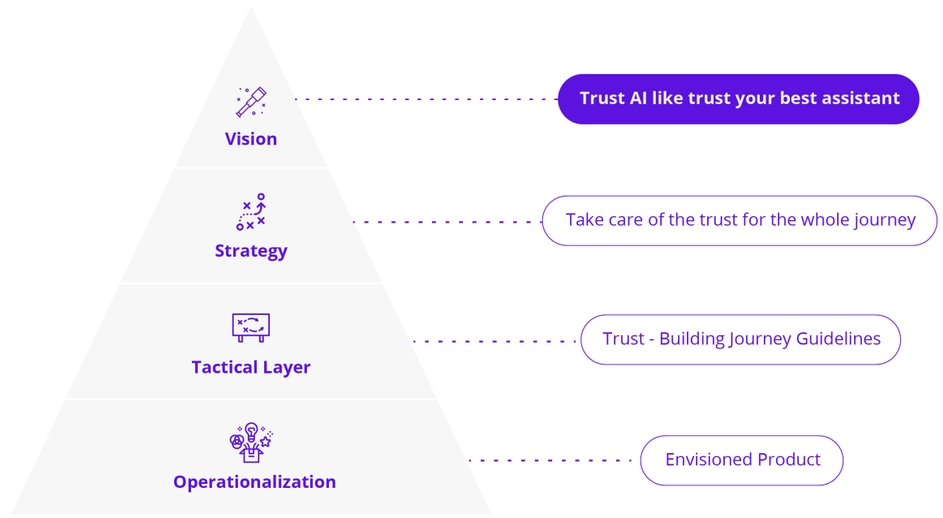



*Figure 6.1: The stategy pyramid*

***" What if you could express your strategy not as numbers or frameworks or even a rhetorical narrative, but as something concrete? What if your strategy took shape as a prototype that shows your organization what success will look like when you have delivered against your goals? "*** *--- Matthew Holloway*





## 6.1.2 Vision

A vision is the ideal future to achieve, which drives the actions of the organization.

Combined with the Exact's vision of No-Hands Accounting, a vision for making it a trustworthy experience is created:

*"Trust AI like trust your best assistant."*

This vision is inspired by a quote from the interview:

*"Using AI functions is like getting a new employee to the office".*

From chapter 3.1.1, we know that trust is a term that originated from interpersonal relationships. What's more, the ideal relationship between users and AI is collaboration. The only difference is that this time, people are collaborating with AI instead of a human. The vision is to make AI your best assistant, who could support you in your work. And you know AI's ability that you only need to supervise it when you think is needed.

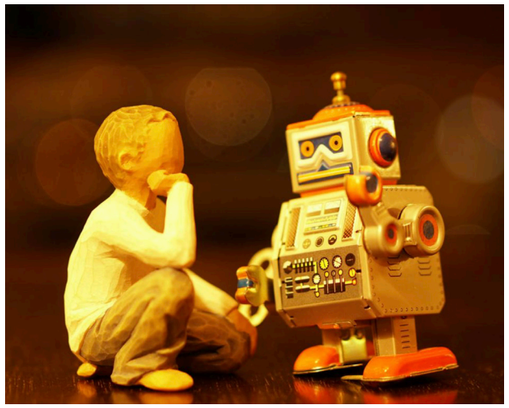


*Figure 6.2: Human - Machine collaboration (credit: Iyad Rahwan)*

## 6.1.3 Strategy

A strategy is an overarching approach to how the vision can be realized.

In chapter 5.3.4, by mapping the insights into the timeline, we could see that trust for AI is a dynamic process rather than a once-established-then-settled object. Plus, the AI function itself is a developing technology. So the strategy "take care of the trust for the whole journey" is proposed. It focuses not only on individual factors but on the whole journey of building trust. This strategy changes the mindset for dealing with trust issues from separate actions to a continues consideration. For example, without this mindset, we may only consider showing the ability of AI when the user is using it; With this strategy to guide the ideation, we could also think about other touchpoints, such as showing the advantages of AI on the website or holding a training session offline.

## 6.1.4 Tactical Layer: Trust-Building Journey Guideline

From chapter 4.2.4, we could see that in the existing development process of AI functions within Exact Online, there is a lack of consideration for trust before the release of the product. Thus a guideline for development should be created to support the trust-building process for not only the existing AI functions as well as future AI functions.

### Design Goal:

Design a toolkit for Exact that could work as a design guideline and facilitate the consideration of trust in the development process of AI functions.

### Target users:

The main target users of the toolkit are those who are participated in the development of AI functions, but also could be those whose work is related to customer support or marketing, since the trust-building journey may involve a wide range of touchpoints with the users. Potential target users are listed below:

Product Owners
UX designers
Cooperate Product Marketing
Data scientists
Service designers (from customer support)

### Design Requirements

1. The toolkit should establish the mindset that trust is a dynamic process

To facilitate the trust-building process, the toolkit should map out the whole journey and identify the different touchpoints in the journey.

2. The toolkit should cover the elements that influence trust.

From the literature review and user research, the elements that will influence the trust towards AI are identified. The framework and elements should be addressed in the toolkit. These elements are:

Purpose: Personal value, Faith, Concern about privacy

Performance: Show ability & advantage, Mistake management

Process: Control, Learning, Situation Interpretation, Ease of Usse

Trigger: Challenge, Fun

3. The toolkit could be used as a checklist to analysis trust issue within existing AI functions or to guide the design of new AI functions

Since Exact is at its beginning of the "No-Hands Accounting" strategy, this toolkit should be able to be used both when improving the existing AI functions, or designing the new AI functions.

4. The guideline should be easy to understand and could provoke thinking or conversations.

As a toolkit, it should satisfy the demand for usability to achieve its goal of taking the trust perspective into the development.





## 6.1.5 Operationalization: Envisioned Product

Based on the strategy, an envisioned product proposal is going to be designed to give inspiration and show possible implementable solutions that could enhance the trust for AI functions within product design.

### Design Goal:

Design an envisioned version of Exact Online that could help users build proper trust towards the AI functions.

### Target users:

The target users of the envisioned product are the users of Exact Online. So the two main groups of users are:

Accountants/ bookkeepers
Entrepreneurs who do bookkeeping themselves

### Design Requirements

1. It is designed to support the automatic functions.

Because Exact Online is a comprehensive platform that contains all kinds of financial administration, it is hard to redesign all the aspects of it. As a result, the design should mainly focus on the automatic functions within Exact Online and support the use of it.

2. The design should propose an automation-based workflow of bookkeeping rather than only improving the existing product.

As addressed in chapter 4.2.4, one of the drawbacks of the development process is that it only adds AI features to the existing product. Thus, the redesigned product should be ideated from an automation-based workflow to create a consistent experience for users.

3. The design should follow the trust-building guideline and give solutions to important elements from the guideline that will influence trust for AI.

The envisioned product is to show the possibilities to work with the design guideline and validate whether it could help users build proper trust towards ai. So the design should consider the elements from the guideline.

4. The design should fit the working habit of users.

To create a natural using experience, the design should fit the routine and working habits of the users. The customer journey from chapter 4.1.2 and the personas from chapter 5.3.6 could be referred.

5. The design should be easy to understand and intuitive to use.

The design should satisfy the demand for usability and be user-friendly.

*Chapter 07*

# The Trust – Building Journey Guideline

This chapter demonstrates the third layer in the strategy pyramid -- the trust-building journey guideline. It starts with introducing the concept of the trust-building guideline. Then it will show the iterative design process of the trust-building journey toolkit. In the end, the final design of the toolkit will be represented.

# 7.1 The Trust-Building Journey

*The trust - building journey combines the dynamic process of trust formation and how differente elements will influence trust for AI in different stages of the process. In this section, the initial concept of the trust building journey will be demonstrated.*

## 7.1.1 The Trust-Building Journey

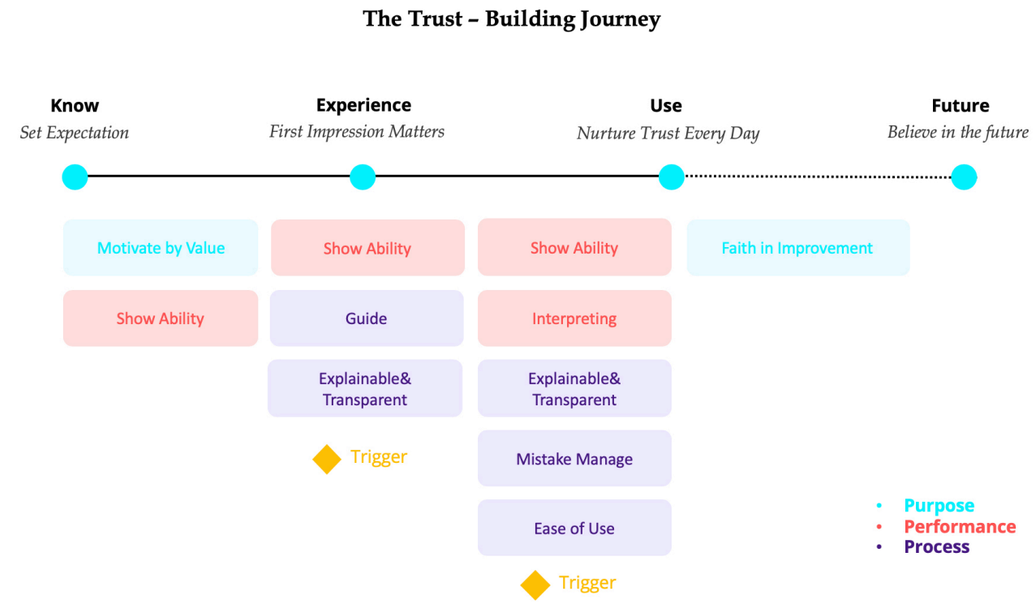



*Figure 7.1: The visualization of the trust-building journey*

The results from the user research show that trust formation is a dynamic process, which means that when considering about building trust, we should be aware of howl trust will be influenced in the whole journey at different touchpoints. By synthesizing the insights, the structure of the trust-building guideline is made. Figure 7.1 shows an overview of the structure.

Three types of trust elements plus a "trigger" category are distributed in the trust-building journey towards AI. The whole journey consists of four phases:

### Know

Phase one is the "Know" phase, where users first know about the AI function. The aim of this phase is to set the right expectation towards AI functions. In this phase, "Motivate by Value" and "Show Ability" are the most critical element to consider.

### Experience

Phase two is the "Experience" phase, where users first experience with the AI function. The aim of this phase is to build a good first impression towards AI functions. In this phase, it is essential to "Show Ability", "Guide" the user well and be "Explainable/Transparent".

### Use

Phase three is the "Use" phase, which stands for the continuous daily use of the AI function. The aim of this phase is to take care of trust in everyday use. During this phase, performance and process elements have a significant impact on trust. "Show Ability", "Interpreting", "Explainable/Transparent", "Mistake Manage" and "Ease of Use" should be considered.

### Future

Phase four is the "Future" phase, which stands for users expecting for the future. The aim of this phase is to make users build the faith that the AI function will get better and better. The purpose element "Faith in improvement" is the core of this phase.

## 7.1.2 Elements in the Journey

In the visualization of the trust journey, each box stands for a specific element. These elements are all derived from the framework generated from the user research. Some of them are excerpted directly from the framework while others may be the combination of two. Each box is explained below:

**Motivate by Value**
Motivate users to use the AI service by addressing their personal value.

**Faith in Improvement**
Faith that it will get better.

**Show Ability**
Show the ability of the AI feature; Show the accuracy of results; Show the advantages that users could get from using AI.

**Interpreting**
Interpret the meaning of the input; Interpret what kind of situation the user is facing; Show "smartness".

**Guide**
Reduce the cost to learn; Guidance; Help them get used to the new way of working.

**Explainable&Transparent**
Be transparent about data; Be transparent about the process; Show what's going to happen; Show why things happen; Show updates; Easy check.

**Mistake Manage**
Less mistakes; Identify mistakes; Easy way of correction (repetitive); good query support.

**Ease of Use**
User-friendly product experience.

**Trigger**
Trigger user to try the function. Positive Triggers: fun, gamification, co-create, reward, social reputation, connection, etc.. Negative Trigger: challenge, pressure, the limit of time, etc..

# 7.2 Iteration of the Toolkit

*A toolkit based on the concpet of the trust-building journey is designed. Here we will describe the iterative design process of the toolkit.*

## 7.2.1 The Iterative Design Process

The concept of the trust-building journey has defined the structure to consider elements that will influence trust. But it is still not able to be directly used by the target users. So a toolkit suitable for application is to be designed based on the trust-building journey.

The design process of the toolkit is iterative and closely collaborated with the target users. Figure 7.2 shows the process for the toolkit design.

There are two rounds of evaluation with internal stakeholders. First, internal presentation and discussion about the trust-building journey are held. Based on the review, the design requirements and improved. After that, the first prototype of the toolkit is created. Then it follows testings with several target users to get feedback on the design. By integrating the feedback from the testing, the final version of the toolkit is designed.

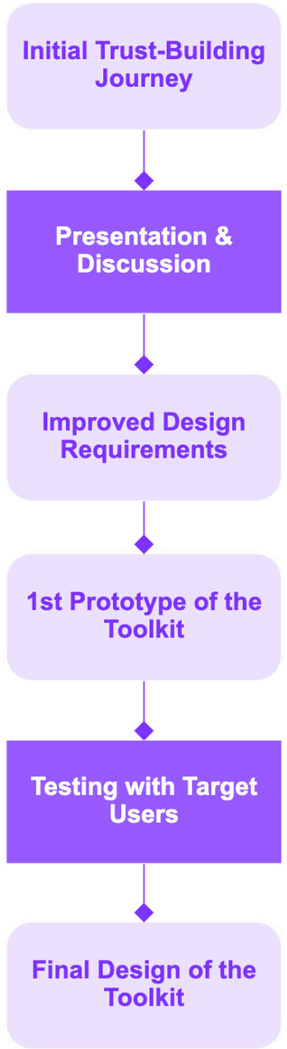



*Figure 7.2: The design process of the toolkit*

## 7.2.2 Presentation &Discussion

A presentation about the trust-building journey is held internally. The participants include one product owner, two data scientists, and two UX designers. After the presentation, feedbacks are gathered to improve the requirements and design of the toolkit:

1. Though the **external elements** are not what Exact could change, it would be nice to also discuss about them to support understanding for the users.

2. The difference between **different types of users** should be addressed in the journey.

3. It would be helpful to show the **hierarchy** of these elements, so when the developers are considering implementation, they could know which elements to pick up at first and which later.

4. As an element, the **Ease of Use is too general** which always needs to be considered. It would be more logical to move it to the category of "Trigger".

## 7.2.3 Testing with Target Users

According to the design requirements proposed in chapter 6.1.4 and the input from the internal discussion, the first prototype of the toolkit is created.

The prototype is tested with four users in total and keeps being iterated along the process. One UX designer, one product manager and one design manager from Exact participate in the testing. Besides, a master design student who has previous experience in toolkit design is also recruited for the testing.

*Figure 7.3: Pictures from the user testing*

Regards to the feedbacks from the testing, the design requirements are evaluated.

### Evaluation on Design Requirements

1. The toolkit should establish the mindset that trust is a dynamic process

The toolkit shows the process and could guide the users go through the different stages.

2. The toolkit should cover the elements that influence trust.

The elements are all addressed on the modules and deckcards.

3. The toolkit could be used as a checklist to analysis trust issue within existing AI functions or to guide the design of new AI functions

The users agree that the toolkit could help them to consider trust in the development process.

4. The guideline should be easy to understand and could provoke thinking or conversations.

The users like the interactiveness of the toolkit, because it makes the tool easy to use. One participant commented, *"it is interactive and visual, and it is interesting to use."* There are also some suggestions on the improvement of usability. These suggestions will be discussed below.

### Feedbacks on Improvement

1. The discription or name of some elements is not clear.

2. Make an **template to record the discussion result** could also guide the discussion.

3. Think about how to make use of the result of the external elements.





# 7.3 The Toolkit Design

*Based on the design requirements and the feedbacks from the two rounds of testing, the final version of the toolkit is designed.*

## 7.3.1 Overview of the Toolkit

The design toolkit comprises two blocks. The "Trust Persona" and the "Trust- Building Journey". The "Trust Persona" focuses on **discribing the the external elements in the context of the user**, while the "Trust- Building Journey" focuses on **inspiring consideration and discussion around the internal elements about how to integrate them in the AI service.** The complete toolkit could be found in Appendix 5.

## 7.3.2 Trust Persona

This tool is aimed to understand and profile the external elements that will influence the user's trust propensity. This tool consists of three part: **the instruction, the trust modules and the discussion template**.

### The Instruction

The instruction is a guide for using the tool. Figure 7.4 shows the image of the instruction. It include an introduction to the trust persona and how to use it.

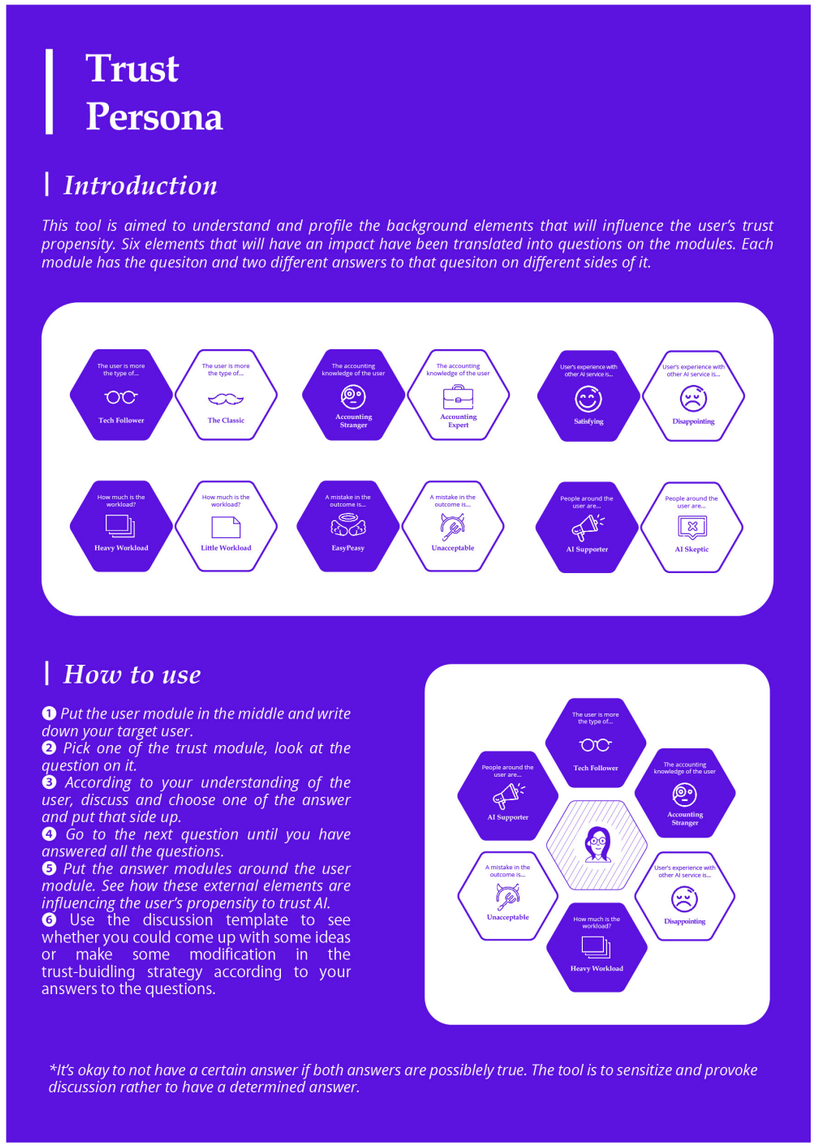



*Figure 7.4: The instruction of the toolkit*






*Figure 7.5: The trust modules of the toolkit*

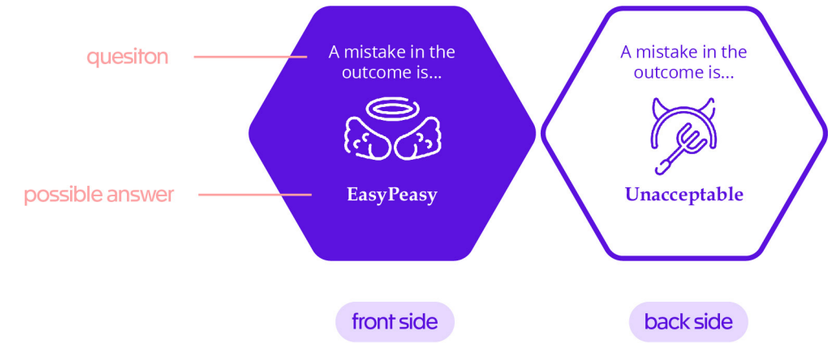



*Figure 7.5: Design of the trust module*

### Trust Module

The trust modules are used to desribe the external elements about the user that will influence the trust formation. Figure 7.4 shows the overview of the trust modules. Six elements that will have an impact on trust have been translated into questions on the modules. Each module has the quesiton and two different answers to that quesiton on different sides of it. Figure 7.5 shows the design of one module.

**The answer on the purple side means it might lead to overtrust. And the answer on the white side means it might lead to mistrust.**

If one of the answer is selected, we could turn the side of that side up. After answering the six questions and put them together around the module representing the user, we could get a "trust persona" for our users of AI service (Figure 7.6).


*Figure 7.6: One example of the trust persona*

that side up.

❹ Go to the next question until you have answered all the questions.

❺ Put the answer modules around the user module. See how these external elements are influencing the user's propensity to trust AI.

❻ Use the discussion template to see whether you could come up with some ideas or make some modification in the trust-buidling strategy according to your answers to the questions.

## Discussion Template

After the trust persona is formed, the user could use the discussion template to further interpret the external trust elements or have discussion around how the whole persona and each element could change the trust strategy or inspire new idea.

Figure 7.7 displays the whole set of the discussion, with one focuses on the overall trust perosna while the others focuses on the individual elements. One each template, there will be interpretation about the anwers and a guiding question for discussion.

## How to Use

The steps of using the "Trust Persona" are introduced below:

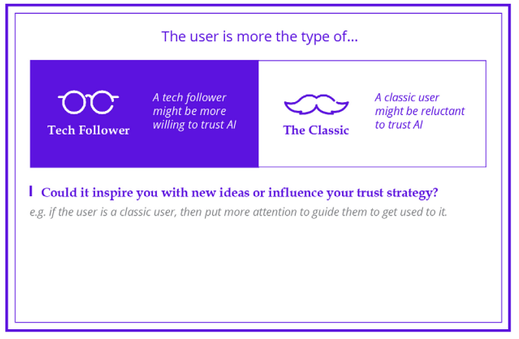
❶ Put the user module in the middle and write down your target user.

❷ Pick one of the trust module, look at the question on it.

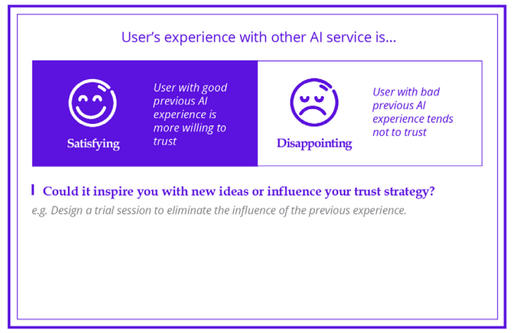
❸ According to your understanding of the user, discuss and choose one of the answer and put











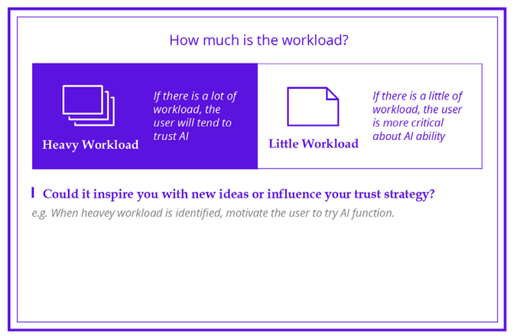




*Figure 7.7: Discussion Templates*

## 7.3.2 Trust-Building Journey

The second part, as well as the core part of the toolkit, is the trust-building journey tool. It is to provoke consideration and discussions about the internal elements of trust formation in a mindset that take the trust-building process as a whole journey. By considering the elements, the developers could improve the product or service from the trust perspective and help the users of their AI service build proper trust.

The design of the tool follows the design requirements (chapter 6.1.4) and the feedbacks from two rounds of evaluation (chapter 7.2.3). The tool consists of three parts: the Trust-Building Journey, the Trust-Building Deck, and the Trust Brainstorm.

### The Trust-Building Journey

The Trust-Building Journey is a map that contains the timeline of the trust-building process and how different internal elements will influence the trust-building process. Figure 7.8 shows the trust-building journey tool. It also includes a short introduction of the concept and an instruction on how to use it.

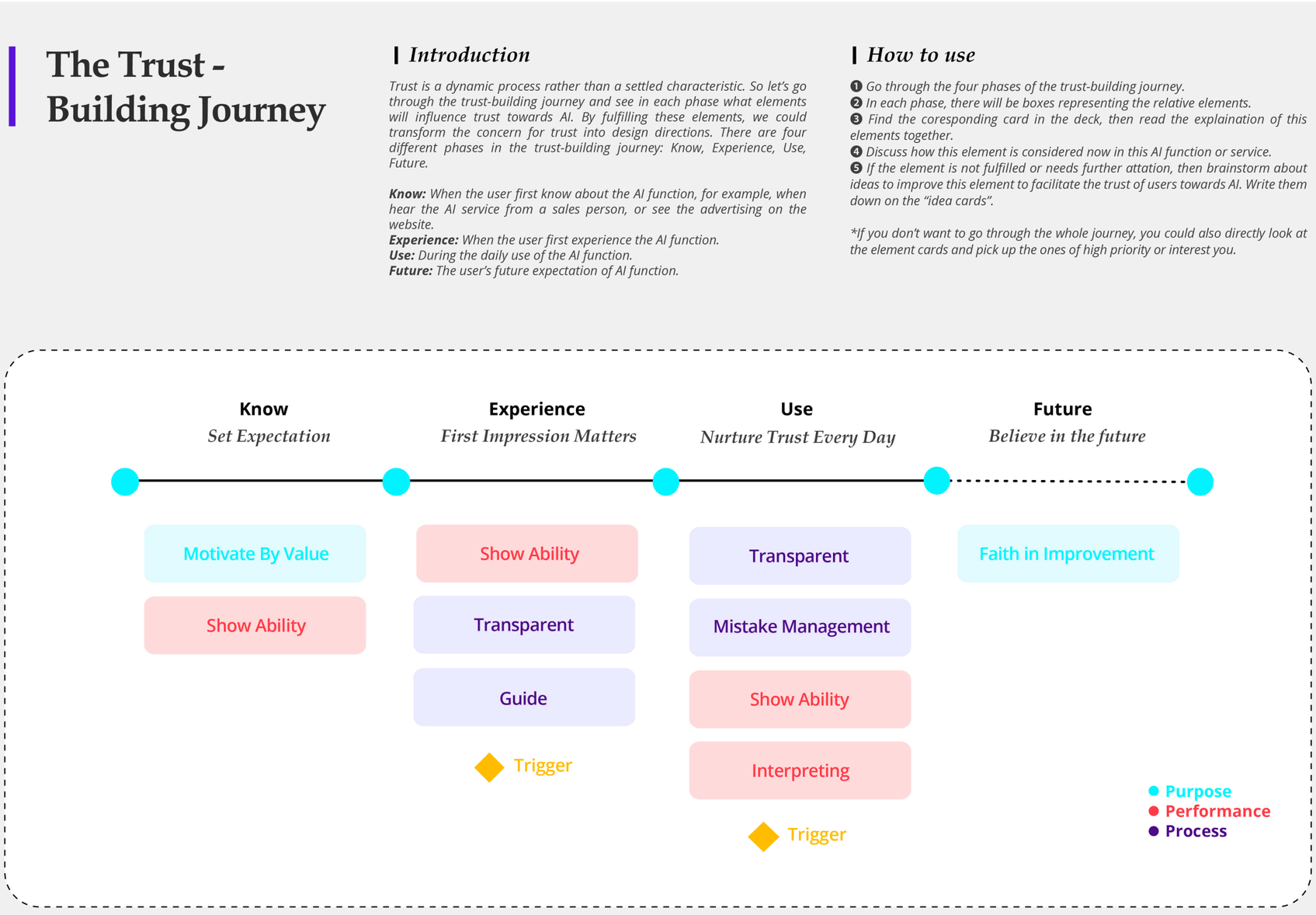



*Figure 7.8: The Trust-Building Journey*

## The Trust-Building Deck

The Trust-Building Deck is a deck of cards that demonstrate the internal influencers of trust formation. Each card is derived from one of the boxes in the trust-building journey. Some boxes might have two corresponding cards due to the multiple aspects of this element.

Figure 7.9 shows the design of the card. Different colors of cards stand for different categories of the elements. On the back side, the element name and the category it belongs to are shown. On the front side, there is a quote in the middle to explain the element. Below the quote, there is a paragraph of concrete explanation on the element. If for this element, the different types of target users have a different focus, then the differences will be addressed below the explanation. At the bottom, the cards will also show in which phases this element might influence the trust. Besides, the priority of this element is displayed on the up-left corner of the card. This could help the developers to prioritize different elements if there is a time limitation.

Figure 7.10 and 7.11 shows the overview of the whole deck of cards


*Figure 7.9: The design of the card*





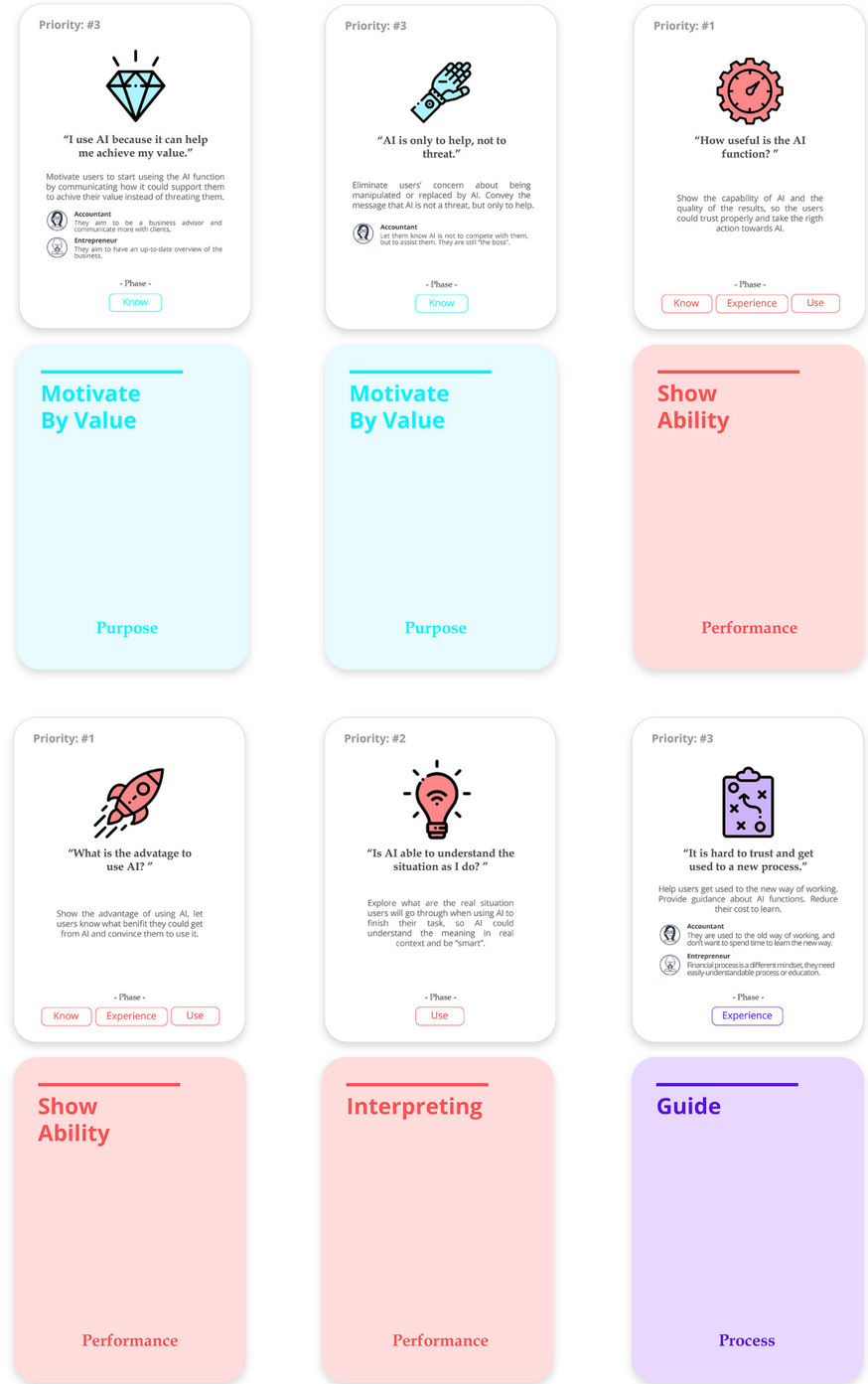



*Figure 7.10: The deck of cards - 1*

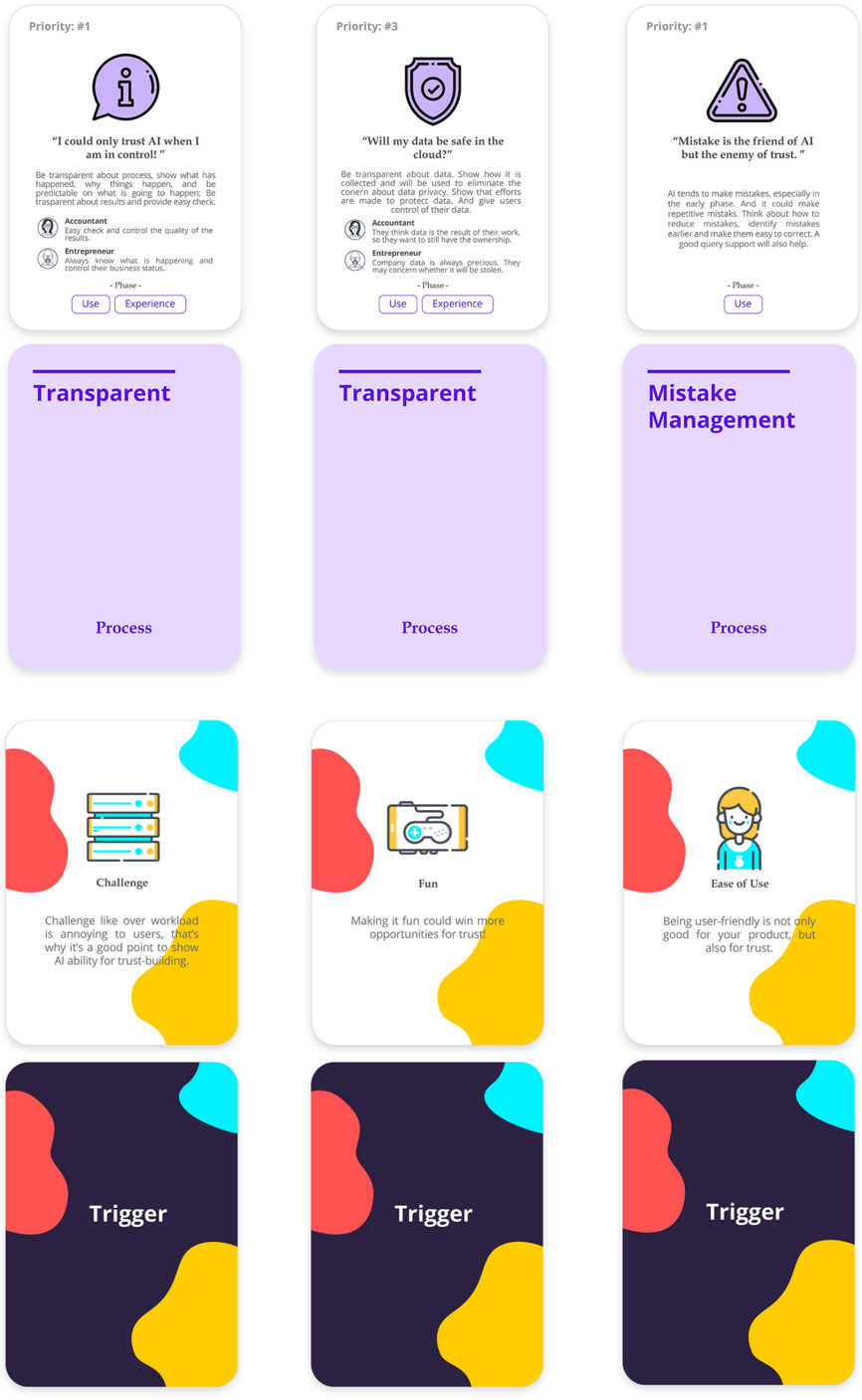



*Figure 7.11: The deck of cards - 2*





## Trust Brainstorm

The Trust Brainstorm is a template that helps to guide the discussion around the element cards. At the same time, it could also facilitate the developers to record their ideas during the discussion.

Figure 7.12 shows the structure of the Trust Brainstorm template. It starts with discussing the current situation of this element within the existing product. Then it promotes ideation about improvement on the existing product. After that, the last question is to inspire ideation about new features or strategies to improve the element for trust.

## How to use

❶ Go through the four phases of the trust-building journey.

❷ In each phase, there will be boxes representing the relative elements.

❸ Find the coresponding card in the deck, then read the explaination of this elements together.

❹ Discuss how this element is considered now in this AI function or service.

❺ If the element is not fulfilled or needs further attation, then brainstorm about ideas to improve this element to facilitate the trust of users towards AI. Write them down on the "idea cards".

*If you don't want to go through the whole journey, you could also directly look at the element cards and pick up the ones of high priority or interest you.

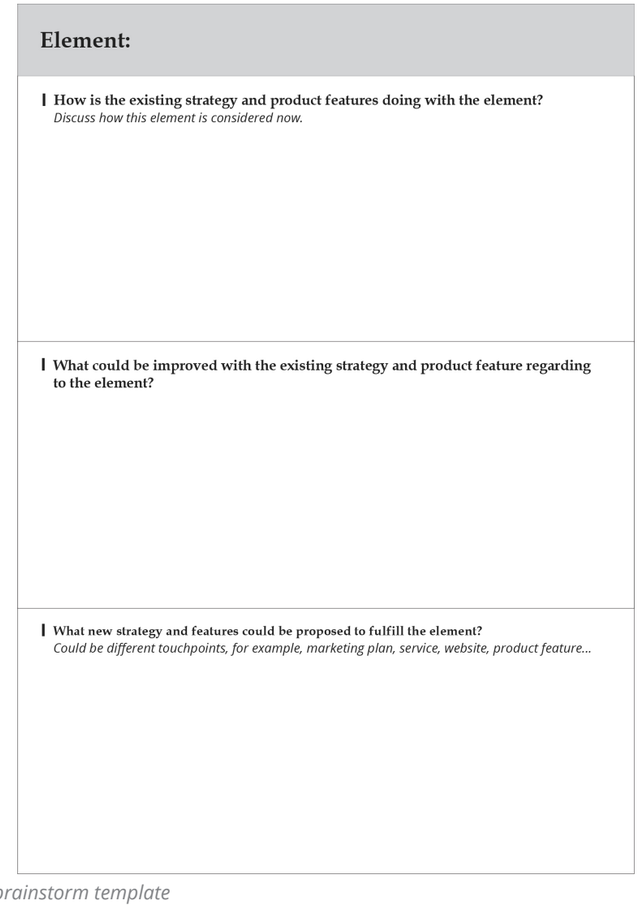



*Figure 7.12: The trust brainstorm template*

*Chapter 08*

# Envisioned Product: Ideation &Iteration

In the last chapter, the tactical layer of the trust strategy is designed by delivering a toolkit for the trust-building journey. To make the strategy more tangible and implementable, an envisioned version of Exact Online is ideated and iterated.

# 8.1 Creative Session

*This section is about the creative session held in Exact with different stakeholders. The process and results will be addressed.*

## 8.1.1 Aim

The core idea of the trust strategy is the trust-building is a dynamic process that will be influenced by different types of elements along the way. According to this mindset, a creative session is held in order to gather comprehensive ideas from different aspects and inspire the final design.

**Goal:**

*Brainstorm about potential solutions to fulfill the trust elements in the trust-building journey.*

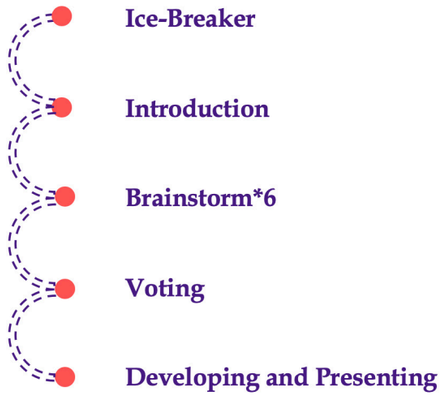



*Figure 8.1: The process of the creative session*

## 8.1.2 Set-Up and Process

Five participants from three different sectors inside the company are recruited in total. Diversity is well achieved by differentiating participants in the positions and familiarity with Exact Online.

Three of them are UX designers, while one is working on Exact Online design, another one is mainly working on other products but has previous experience of design project about Exact Online, and the third one has never worked on Exact Online before. One data scientist who works on automatic functions is recruited to take the technology perspective into account. One employee from Customer Support is recruited in the session and expected to think from the user's perspective and give out-of-box ideas.

The session follows the process in Figure 8.1.

First, an ice-breaker session is held by playing a game about trust. Then it follows a short introduction about this project and design goal of this creative session. After that, six rounds of brainstorming session starts.

*Figure 8.2: Brainstorming on ideas*






*Figure 8.3: Sketches on the trust elements*

In each round, one trust element will be presented with a sketch to demonstrate it (figure 8.3). Participants then brainstorm on how to fulfill this trust element. Besides, random illustrations of objects are provided to the participants to work as stimuli that could provoke creativeness.

When finishing the six rounds of brainstoming, the participants are asked to cluster ideas and then vote for their favorite concepts (figure 8.4, figure 8.5).There are two criteria of voting, one is the usefulness and the other one is the creativeness.

*Figure 8.4: Voting for ideas*

*Figure 8.5: Voting for ideas*

In the end, based on the voting result and personal preferences, each user could choose one idea to develop (Figure 8.6, Figure 8.7).

*Figure 8.6: developing ideas*

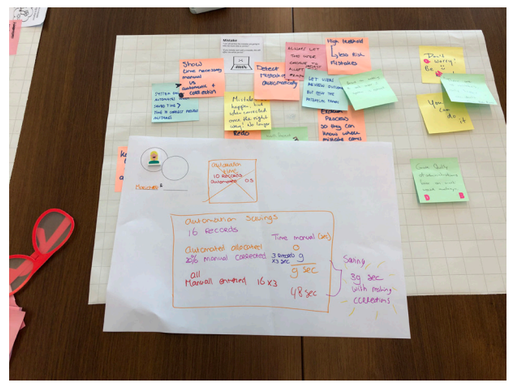


*Figure 8.7: Developing ideas*

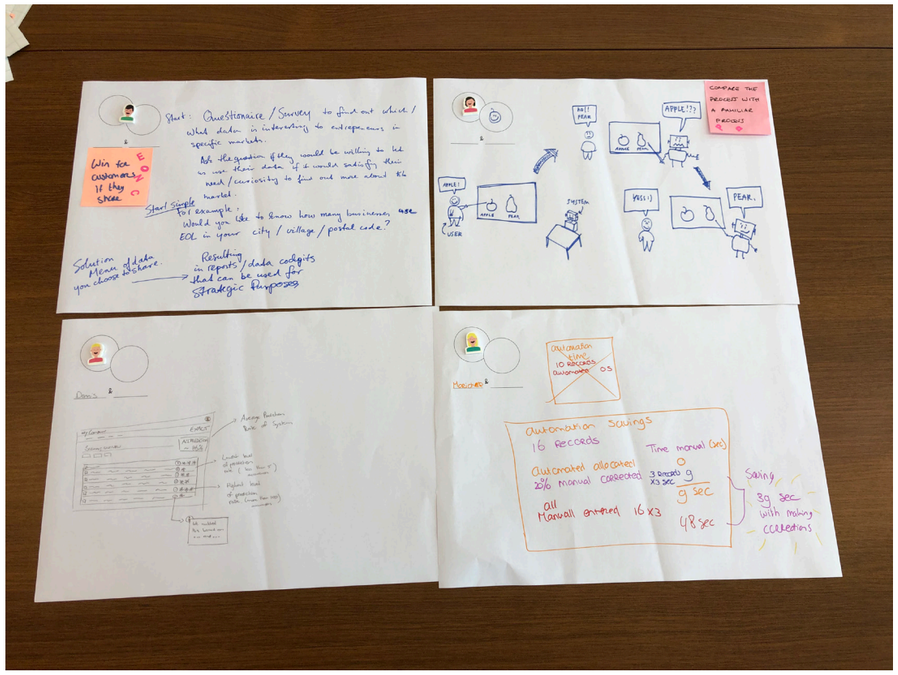



*Figure 8.8: Final ideas developed by the participants*

### 8.1.3 Results from the session

71 ideas in total are generated. After clustering and converging similar ideas, 28 design directions are formed. Example ideas that are promising or have be adopted by the final design are presented bellow for each category.

#### Transfer:

Example of usage by peers.

Guidance during process.

**Step by step to enable more and more automation.**

#### Predicatbility:

Teach users about the model/ system flow.

Description of the working logic of AI: " we matched ... because ... "

**Progressively add more automation.**
**Clearly show and communicate the accuracy level.**

**Let the users tweak the automation setting.**

#### Faith:

Show predicted accuracy for AI features, like "In the future the function will have 80% chance to be allocated correctly".

See automation score going up over time, show this in the dashboard.

**Show historic/predicted time saved graph.**

**Notification: "AI Ability Level Up!"**

**Point out the importance of helping the system learn; Explain to the users that the system will learn from mistakes.**





#### Concern:

Be transparent how we save things and how use it Specific be transparent about how you use data.

**Opt in/ Opt out option : Let users be in control of the data they share.**

#### Control:

**Show what the automation has done, what happen and the result.**

**Build trust by showing performance of background enabled AI (when AI has the same result as the user, show it to the user)**

**Every user decides for him/herself how much to be automated (personalized).**

#### Mistakes:

Make mistakes fun, when mistakes happen, show "Don't worry, be happy." / "There is no mistakes, only happy accidents." / "you can do it".

Grade the quality of different financial administration results from AI.

Always let user choose to accept the proposal or not.

**Based on the confidence of the AI result to decide what the users need to do. Let users review outcome only when there are potential errors.**

**Automatically identify mistakes.**

**Options to appy the same change when once a mistake is corrected.**

**Only to automate when the system find time could be saved.**

**Explain the process so they can know where mistakes can come.**

Compare the process with familiar process.

### 8.1.4 Synthesizing the ideas

From the creative session, a lot of interesting ideas are generated to fulfill the different trust elements in the trust building journey. These ideas are then clustered, merged and redeveloped for the design concept.

Besides, the design concept also combines the input from the strategy pyrimad (chapter 6.1.1), the design requirements (chapter 6.1.5), and the working habits of the users (chapter 4.1.2)

By synthetizing these inputs, the final design concept is formed:

**Design Concept**

*"A review-based automatic bookkeeping experience with personalized automation setting, where users can see the ability of AI and be in control of the process and quality of the outcome."*

The concept is constituted of three main design epics:

***My Automation***

My Automation is the "control room" of the AI functions. The user could choose to automate their workflow step by step with three levels of automation, so that they are able to gradually get used to it. It is also possible to create their personalized automation setting. In the same time, users might feel more in control because they could decide what to automate themselve.

What's more, users could also see the performance of AI. The performance could convince users to try a higher-level of automation if they see improvement, or choose the automation level that best suit them. Showing the performance is also useful in helping users build proper trust towards AI rather than overtrust or mistrust, which might avoid the "trust fall" in the beginning as well.

***Review***

One of the design requirements is the new design should design the workflow from an AI-based perspective. When thinking about how what it be like when the manual work is automated, one of the change could be that the bookkeeper's role may change from entering things themselves to review the results from the machine. Thus, a review mode is proposed. By make reviewing easier for users, the users could identify mistakes in an early stage. Plus, reviewing the results from AI gives them more control because they could always make sure of the quality of the results.

***Inform***

One of the most essential way to support the trust building is to be transparent. So the third epic of the design concept is about informing. It means to give users the right informaiton at the right time. For example, notifying users a daily update about what AI has done for them could make them in control of what is happening. And inform the users why a certain result is created by AI could faciliate users build proper trust towards the result.

Besides the three epics, to achieve the vision of "trust AI like trust your best assistant", the design should convey a feeling of collaborating with AI to the users.

# 8.2 Evaluation and Iteration

*To validate the design direction, evaluation is applied after forming the design concept. After the evaluation, the design concept is iterated.*

## 8.2.1 Testing the Prototype

In order to validate whether the design directions could help user build proper trust towards AI, a low-fidelity prototype that presents the initial design of the concept is used for testing the ideas.

Considering the fact that testing with the real users of Exact might influence their impression and expection of Exact, this testing session is conducted with internal experts and stakeholders. Four participants are recruited for the testing, while two of them are accountants from Exact and two are designers from Exact.

The following research questions are made for this evaluation:

1. Does the overall design makes the AI process mroe trustworthy?

2. Will the three levels of automation help you to step by step build trust? And how should the three level of automation be defined?

3. How much do you think you want to personalize on your automation setting?

4.Are the information displayed in "My Automation" and other touchpoints seem interesting? What else do you think need to be displayed?

5. Do you think the daily update of AI is useful? Do you think it fits your working habbit?

6. Do you think the bookkeeper's role will change from entering to reviewing?

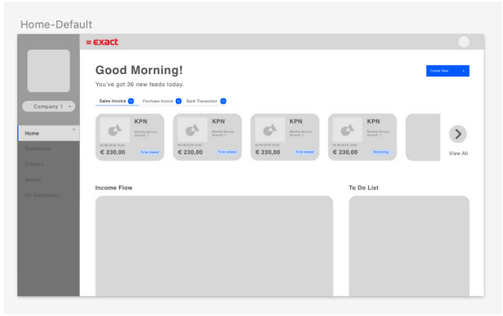



*Figure 8.9: The low-fidelity prtotype - Homepage*

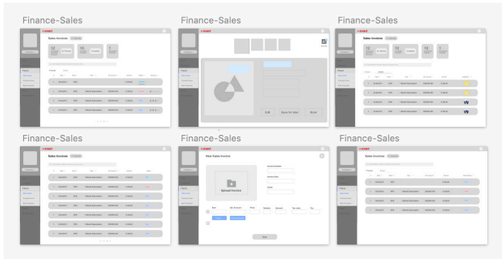



*Figure 8.10: The low-fidelity prtotype - Finance*

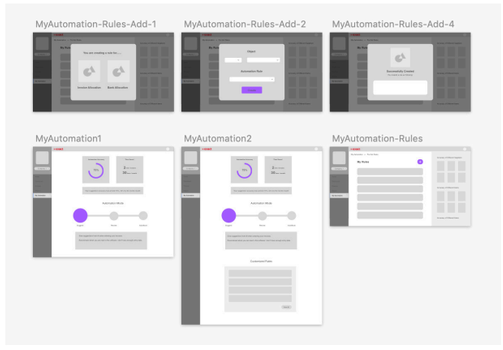



*Figure 8.11: The low-fidelity prtotype - My Automation*





## 8.2.1 Testing Results and Suggestion on Iteration

From the testing result, participants think that the design gaol to make the AI prcess more trustworthy is fulfilled. What's more, they also agree that the with more and more things being automated, the bookkeepers will change their role to review the results rather than entering. Thus, the main direction of the design concept is validated to rigtht.

Besides, some design options are made, and some suggestions are adopted for iteration on the design. Here are the insights that are applied to guide the final design:

### Insights in My Automation

They like to see the insights about AI performance. One of the user says "the time saved" is the first thing comes to his mind when he thinks about the automation ability. He would be very interested in this information and would be very happy if he sees automation saves him xxx time.

The insights showed about the automation ability should not looked like judging the user. This is a lesson drew from a similar function in the existing product, where the product shows how much percentages of clients of the accountant has used automation. This information upsets users because it is judging on them and actually they could not make it 100%.

### Three levels of Automation

Users don't need "partially automated" proposal, a full automated proposal is preferred.

It's better to have "suggestion" rather than "identifying mistakes" as the primary level automation. This is because some users who are new to Exact Online might have some problems with filling the invoices. In this case, a suggesting function seems to be more useful than a mistake identifying function. In addition, it sounds more user-friendly to assist users rather than "judge" users.

Trigger the user to go to the next level of automation.

### Information About How AI decision is Made

Clues about how the automatic result is created should not be too much.

### Personalized Setting in My Automation

For the personalized automatic rule setting function, users might feel it complex to process, and if the rule is too complicated it might again drift away from "automation" to "manual work". So the rule should only be simple rules like setting to automate one certain supplier or not. Plus, an easy way to set the rule with facilitating information should be designed.

*Chapter 09*

# Envisioned Product: Final Design

After the initial evaluation, the design concept is further developed based on the feedbacks from the testing. This chapter will introduce the final design of the envisioned prodcut.

# 9.1 Final Design

## 9.1.1 Introduction

In the last chapters, we have discussed about the strategy to build trust in Exact Online (Chapter 6) and the "Trust – Building Journey" guidelines (Chapter 7). Based on these requirements, ideation sessions are conducted to transform insights to design of an envisioned product. After synchronizing the ideas to the design concept and three design epics (Chapter 8.1), then testing with a wireframe prototype (Chapter 8.2), the final design of the envisioned product is iterated and refined. In this chapter, the concept will be introduced in detail.

## 9.1.2 Product Structure

Figure 9.1 shows the information structure of the whole concept. According to the relativeness to trust, three main sections are being developed: "Home", "Purchase" and "My Automation". "Bank" and "Sales" are not developed in this project because creating bank statements and sales entries share a similar workflow with creating purchase entries, "Purchase" is the representative of the three automatic workflow.

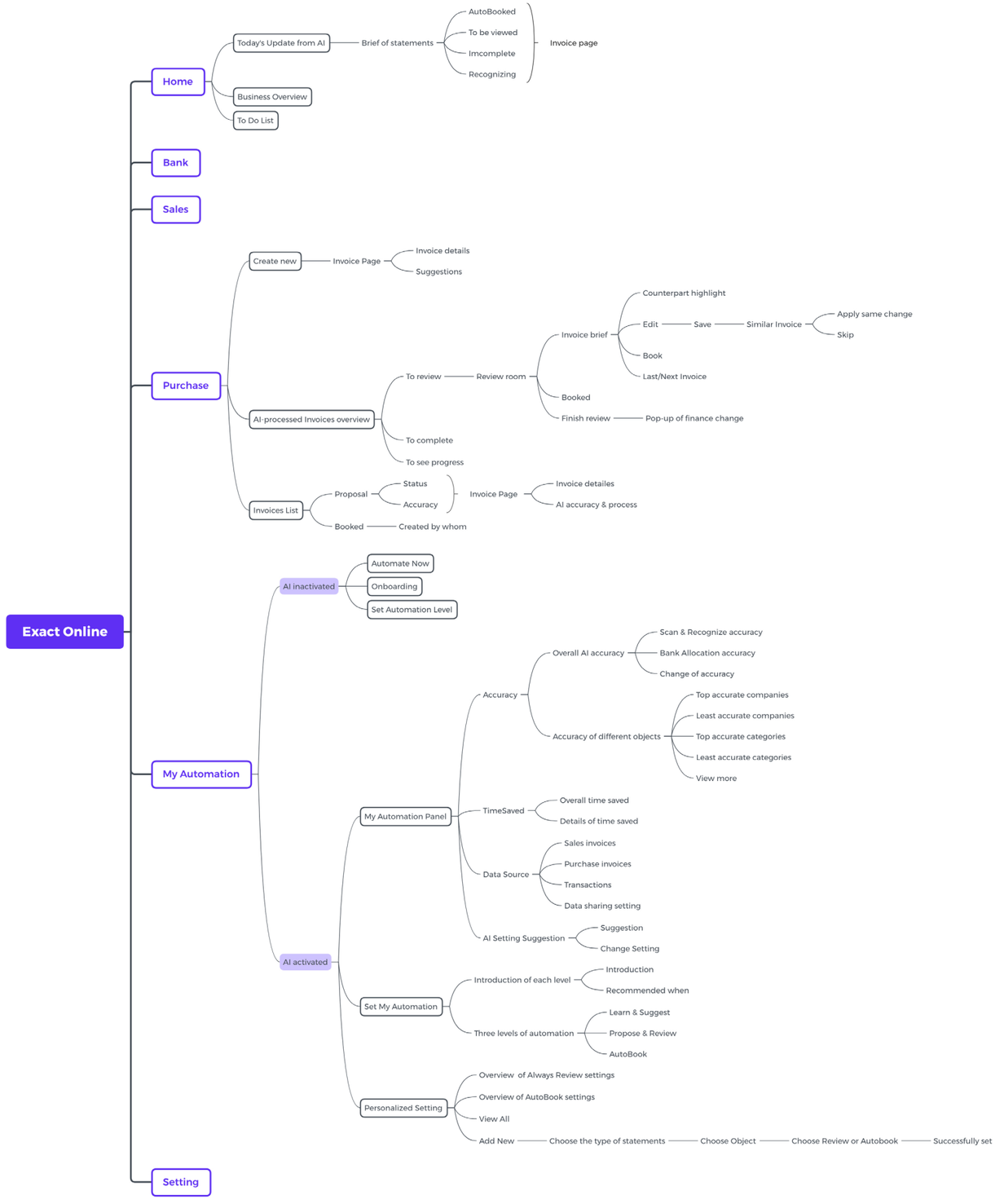



*Figure 9.1: Information Structure of Exact Online (redesigned)*

### 9.1.3 My Automation

"My Automation" is the sector where users could manage their automation setting and have an overview of how the automation is doing. It shows different content according to whether users have activated the AI service.

When the user has not activated any AI services, this page will act as an onboarding page to convey what values could these AI services bring to the user. The descriptions of the value are aligned with the research result. In this case, the value for accountants are to spend more time on advising their clients based on the financial status. For entrepreneurs, the value is to give an up-to-date overview of their business and they could concentrate on what they are really passionate about. The message about the value is aimed to make users trust the purpose of AI that it is created to help users rather than replacing them. On the other hand, the message could motivate users to try the AI functions.

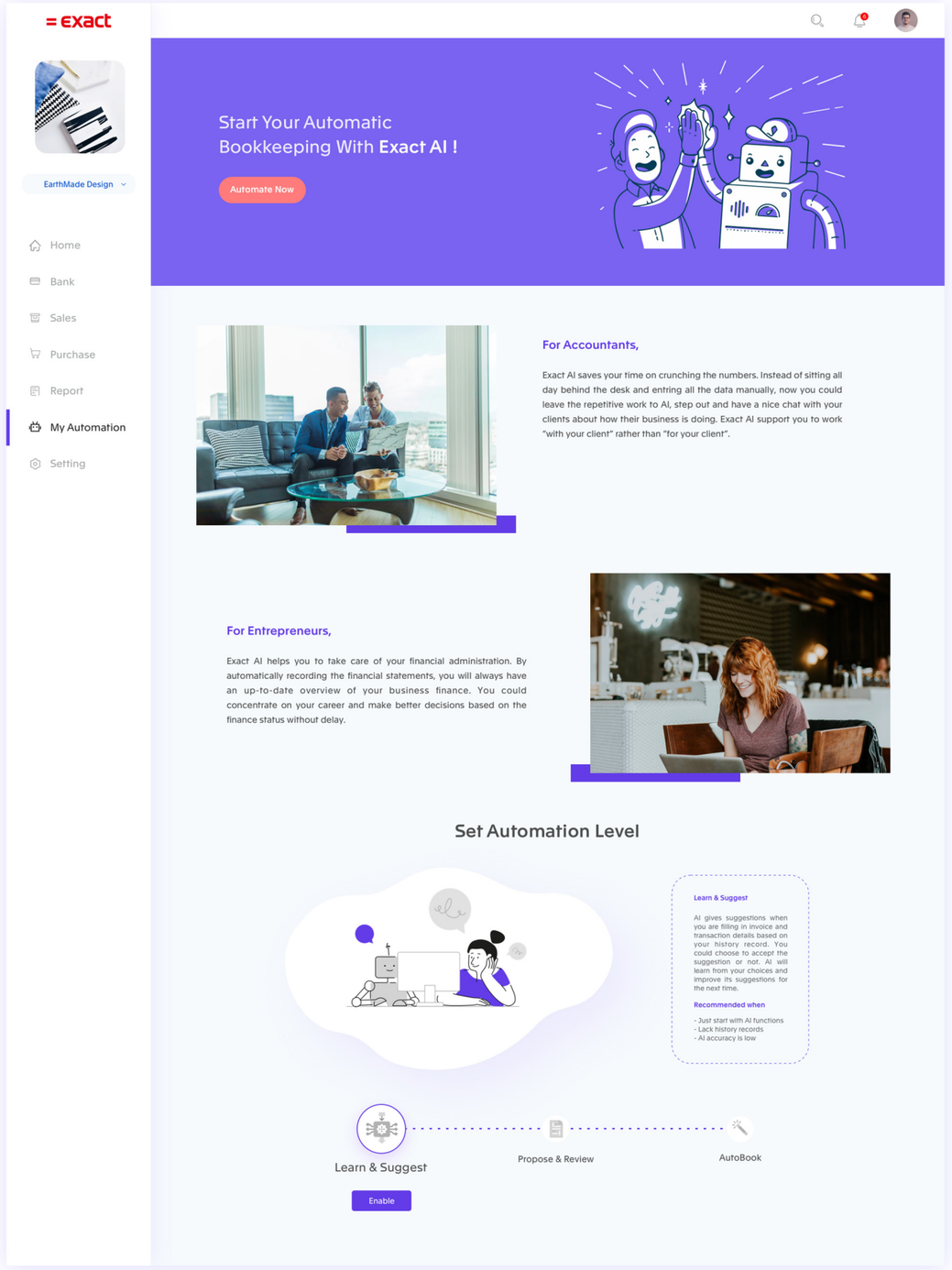



*Figure 9.2: My Automation - AI service not activated*

After the user enabled one of the levels of automation, "My Automation" will become the "console" of AI. Figure 9.3 shows the overview of how it looks like. The page consists three main parts: My Automation Panel, Set Automation Level and Personalized Setting.

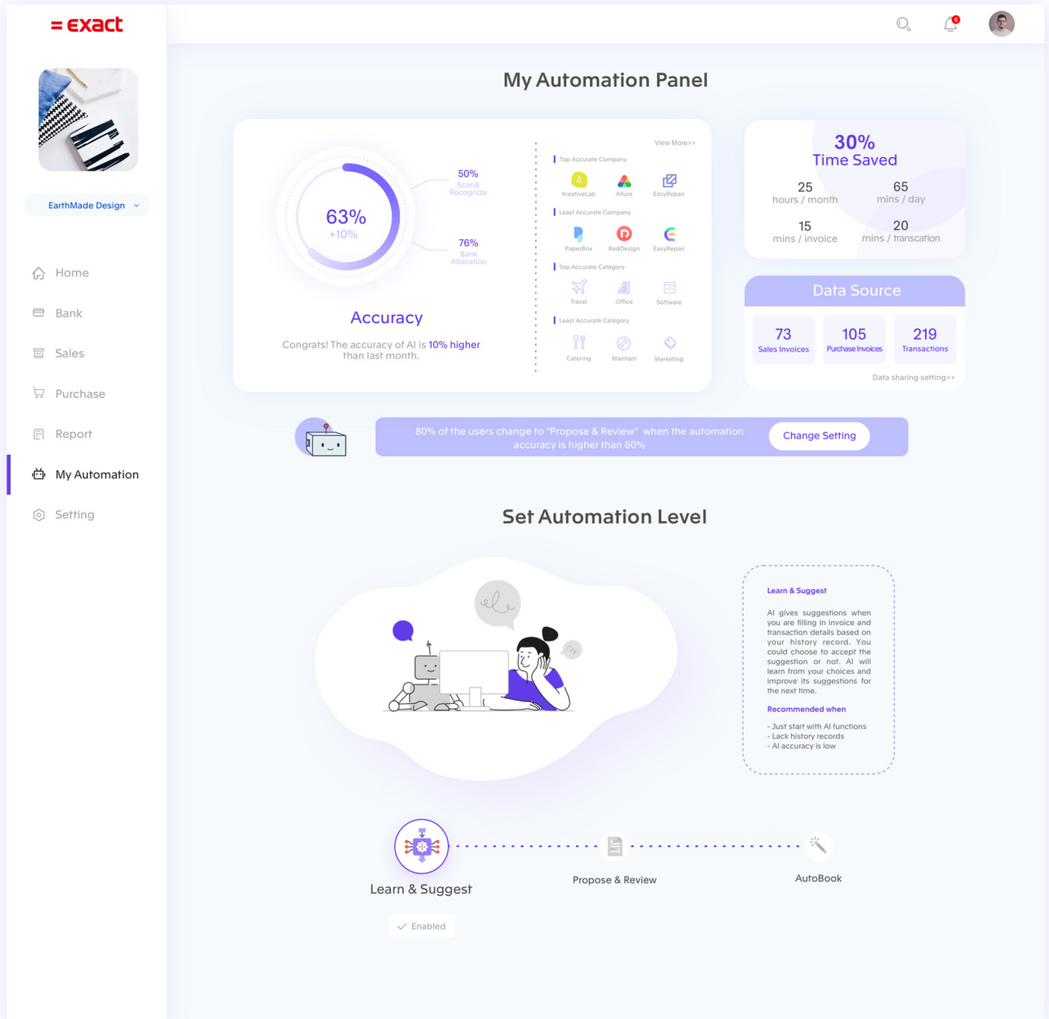



Figure 9.3: My Automation - Learn & Suggest





## Set Automation Level

In this section, the user could manage the automation setting and know about how each level the automation is working. There are three levels of the automation setting. They are "Learn & Suggest", "Propose & Review" and "AutoBook". Figure 9.4 shows the interface flow of setting the automatic function.

For each level of automation, there will be a short introduction of this level about what will AI do. The recommendation of when to use this level is also shown to help the user choose the level that fits the AI ability and the user's need.

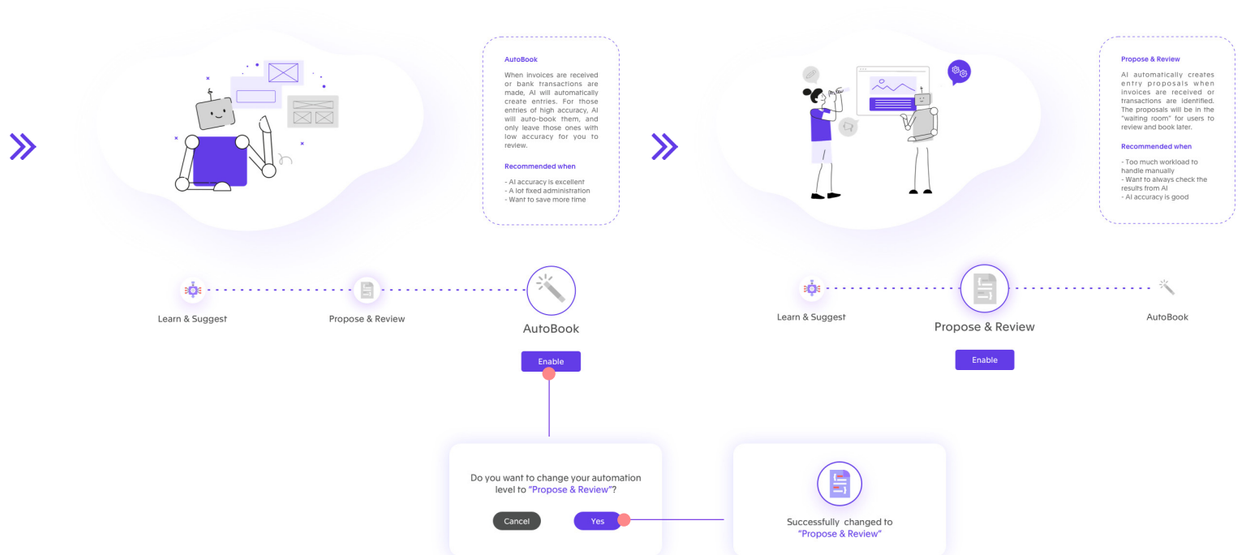



Figure 9.4: The interface flow of enable a level of automation.

## Learn & Suggset

This is the first level of automation. In this level, AI only gives suggestions about what to fill in when users are creating an entry. (See Chapter 9.1.4). In the same time, AI is also learning from the user, for example, what G/L account does the user fill for this item, and does user accept the suggestion or not. Based on the answers, AI could improve its ability until it gives high-quality results. "Learn & Suggest" is recommended when the user just start with AI functions and don't have enough entry records for AI to produce accurate proposals.

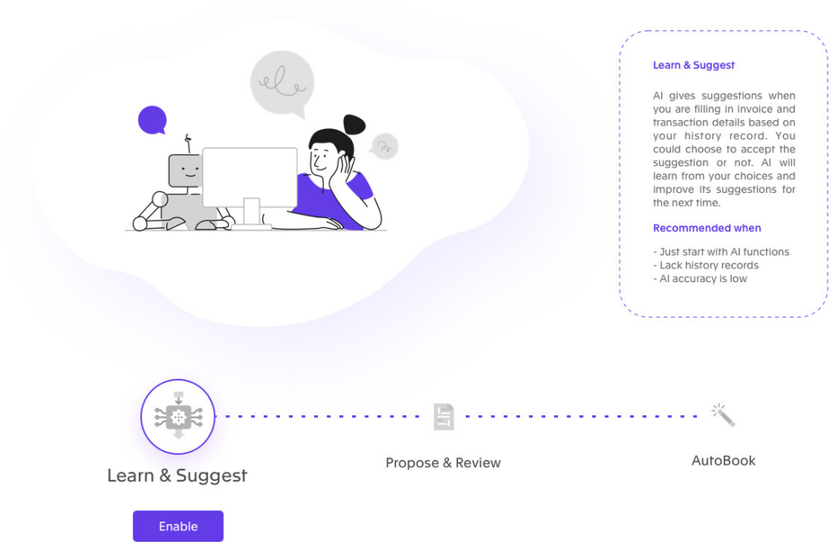



*Figure 9.5: Automation Level One- Learn & Suggest*





## Propose & Review

In this level, AI start to automatically create entry proposals when invoices are received or bank transactions are made. The proposals created by AI will wait for the user to review the and book. When set this level of automation, the user could always know what is happening and be in control of the results and entry quality. Mistakes are easier to identify when the user is reviewing. This level is recommended when the AI accuracy is satisfying to create proposals and the user want to do less manual work. It is also suitable for those users who have low tolerance of mistakes and always want to check the results from AI.

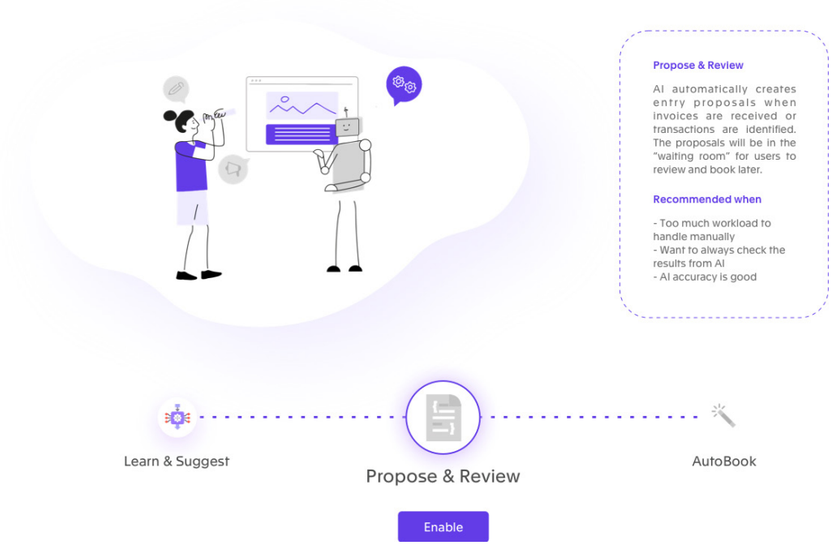



*Figure 9.6: Automation Level Two - Learn & Suggest*

## AutoBook

"AutoBook" is the highest level of automation. Instead of leaving all the entries for the user to review, within this level, AI will divide the entries of high confidence and low confidence into two groups. For those entries of high confidence, AI will book them automatically; For those entries of low confidence, AI will leave them for the user to review. This level is recommended when the results of AI is mostly right or there are a lot of fixed financial administration that are hard to be identified wrong, and the user could save a lot more time on booking entries.

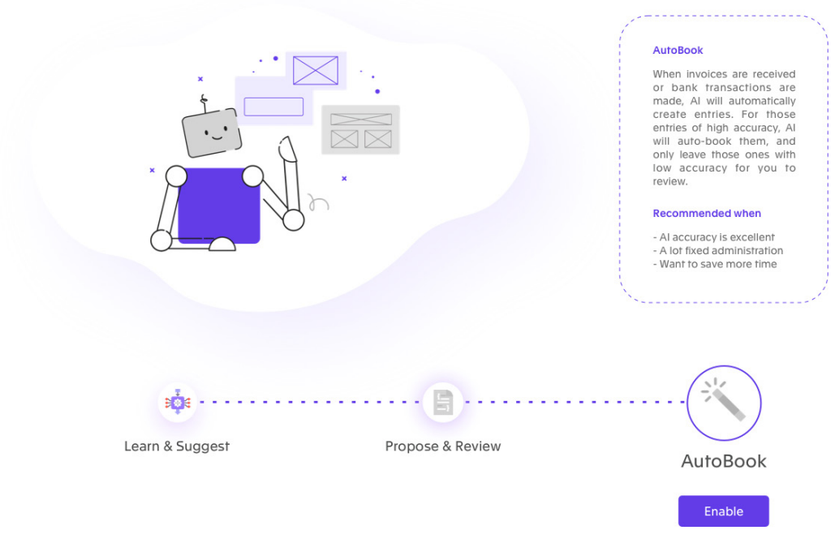



*Figure 9.7: Automation Level Three - AutoBook*





## Personalized Setting

The three levels of automation could give users easy options to set how much they want their work to be automated. But sometimes users also want more variabilities on their automation setting. This is because of the fact that they find AI quality could differ a lot from different administrations. Through Personalized Setting, users could set personalized automation rule for certain companies, accounts, categories or items. Users could always leave them for review, or make them autobooked when they are very confident about the results. Figure 9.8 shows the interface of Personalized Setting

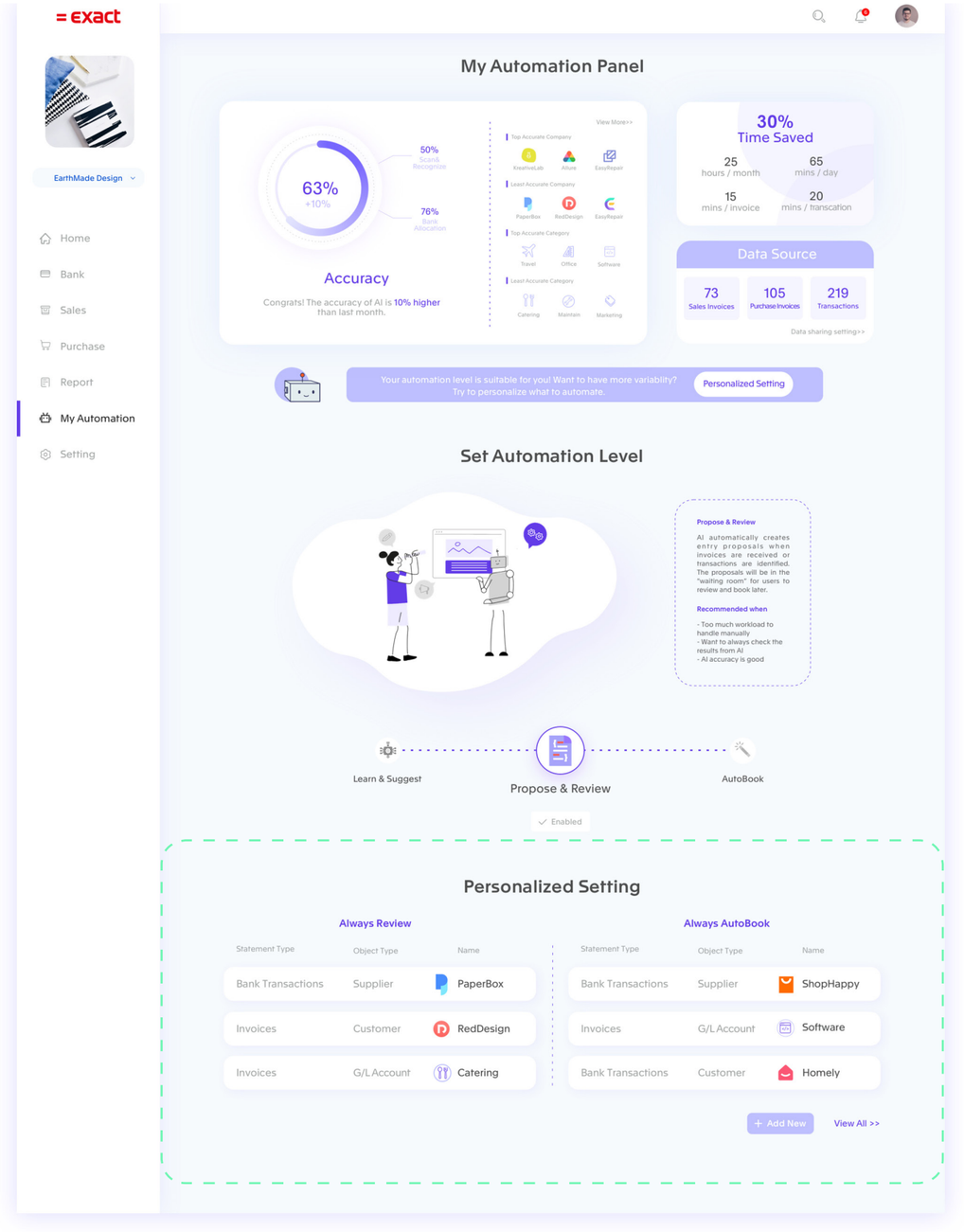



*Figure 9.8: My Automation - Propose & Review - Personalized Setting*

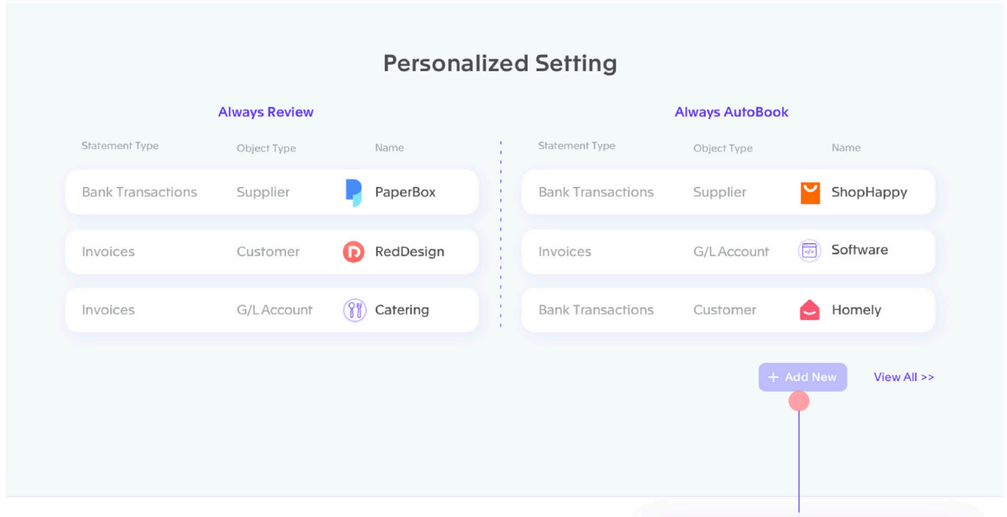



*Figure 9.9: Option-based process to add a personalized setting*

In the section "Personalized Setting", there will first be an overview of what administrations the user has assigned with personalized settings. The user could add new personalized setting by using the "add new" function.

To make it easy for users to set rules for different administrations, an option-based process is designed.

Figure 9.9 shows the process of creating a new personalized setting. First, users need to choose whether they want to personalize for invoices or bank transactions. Then they could choose the object – is it a supplier, a client, a category or an item. After selecting a certain object, they could choose to always review the result from AI or always automatically book the result from AI.





## My Automation Panel

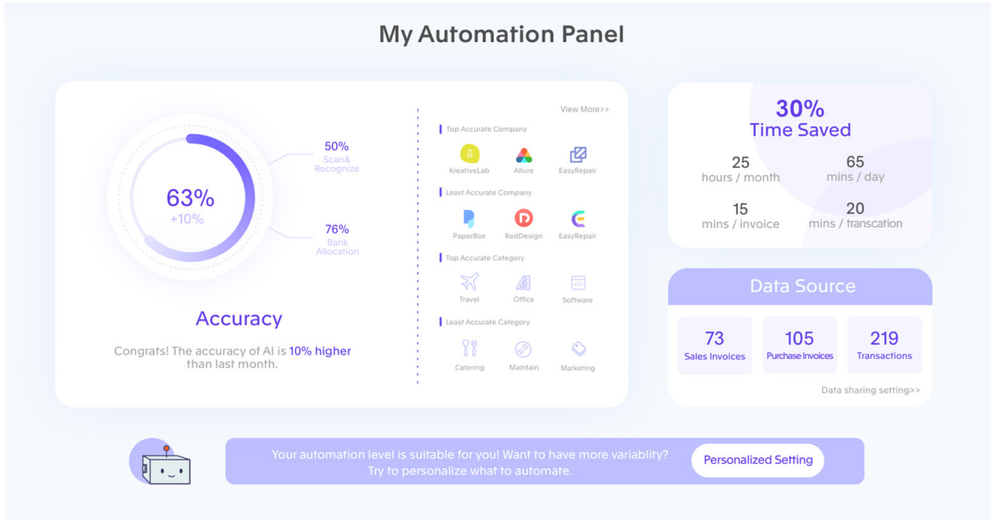



*Figure 9.10: My Automation Panel*

This section shows users insights about the AI ability. Three different types of data are shown on the "panel". First, users could see the accuracy of AI. This could help them decide how should they trust the result from AI. The progress of AI accuracy will also display on the interface to give users the feeling that it keeps improving. Besides the overall accuracy of AI, ranking lists of specific administrations that have the top or least AI accuracy are shown to give more details about the accuracy, which could be used as a reference when they want to create personalized settings.

On the right side there shows the time-saved by AI. When it comes to the advantages of AI, most users are very interested in how could AI make their work more efficient. In hence, showing how much time AI has saved for them could motivate users to trust the AI functions.

Information about data source is provided on the panel. They could go to adjust their data-sharing settings and choose what to share and what not. In this way, they could stay in control of their data and diminishes the concern about data privacy.

At the bottom of this part is a piece of suggestion from AI. Based on the ability of AI like accuracy and time-saved, AI will advise users on how to set the automation to the one that fits the user most. The information about AI ability and the suggestion could give users the reason why they should update the automation level or not. In the same time, setting a proper level of automation could decrease the possibility of making mistakes and make the best out of AI, which will help user build the right trust.

### 9.1.4 Home

Home is the default page of Exact Online. It mainly shows the business overview and the to-do list of the user. Figure 9.11 shows the "Home" page when the user doesn't use automation or use the "Learn & Suggest" level of automation.

When a more advanced automation level is activated ("Propose & Review" or "AutoBook"), on the home page there will be a section that shows the daily updates about what has been processed by AI (see Figure 9.12).

The core information of the proposals created by AI such as the amount, the sender/receiver and the category will show in a card to give users a quick impression on what is new that happening with their business. Besides, the status of the proposals will also show in the card, so users could know what they need to process later.

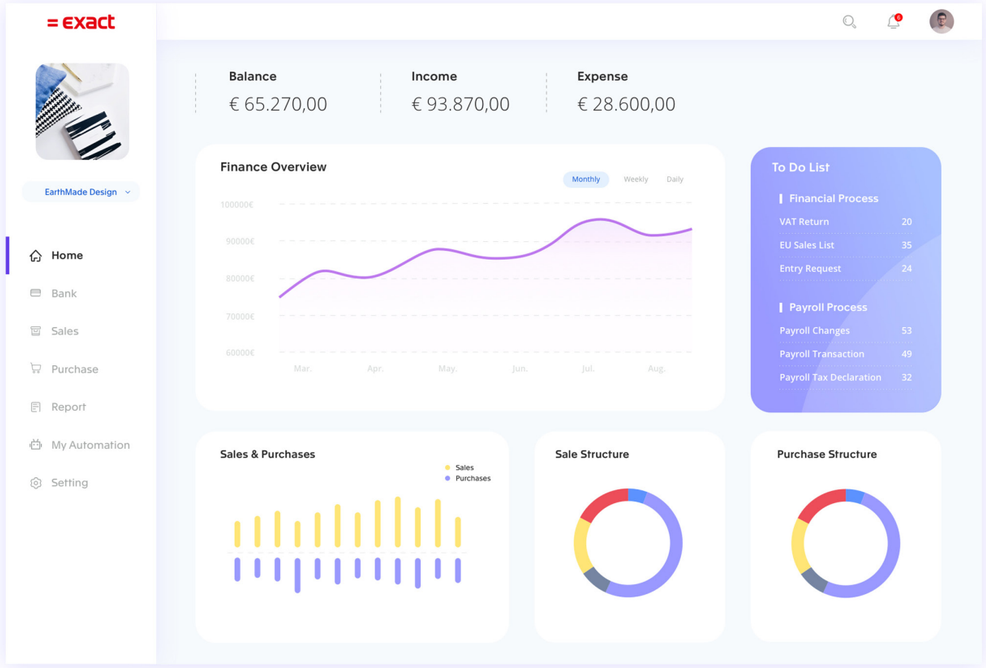



*Figure 9.10: Homepage - Default*

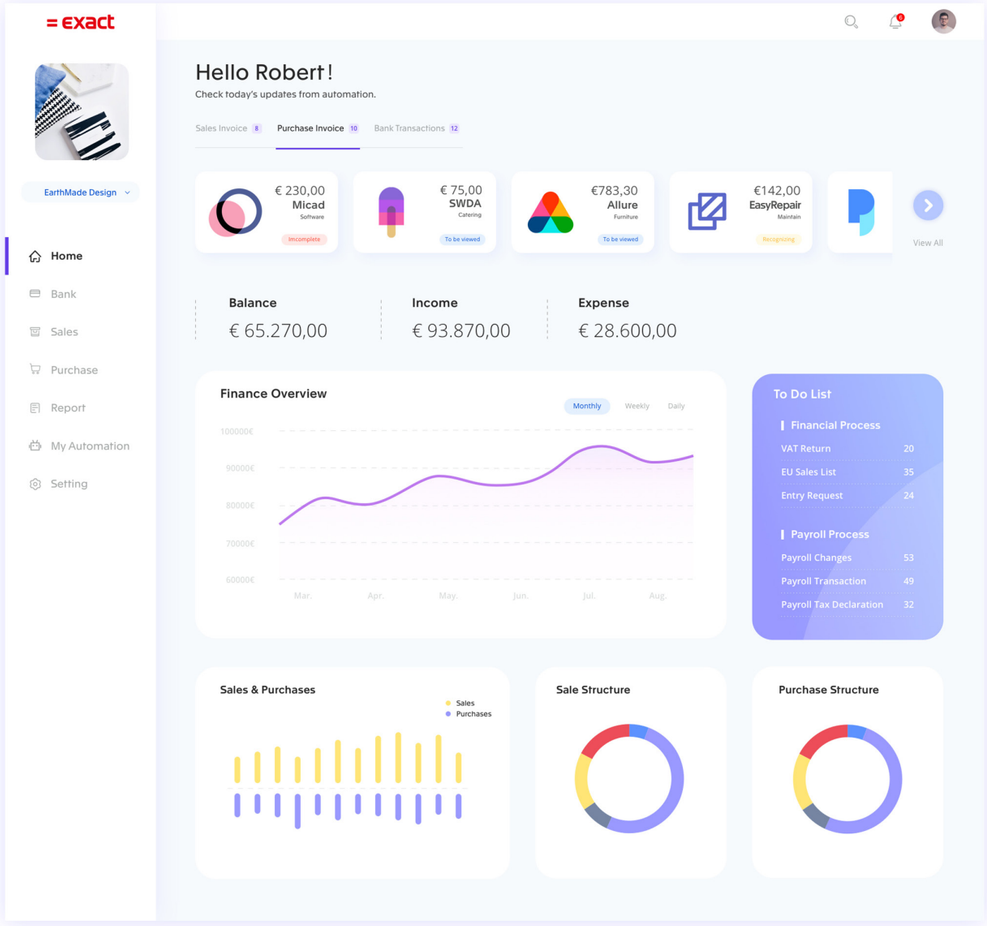



*Figure 9.11: Homepage - Show daiyly updates from AI*

## 9.1.5 Purchase

The "Purchase" page is where users manage all the bookings of purchase and create new entries. When the "Learn & Suggest" or higher level of AI is enabled, users will be facilitated by AI suggestions while they are creating new entries.

When the user fills some information about the purchase, related suggestions on other information will be made based on the user's history entries. If the user clicks on the suggestion, the suggestion will be accepted and fill in the box. This function could help users work more efficiently when they are manually creating a new entry (Figure 9.13)

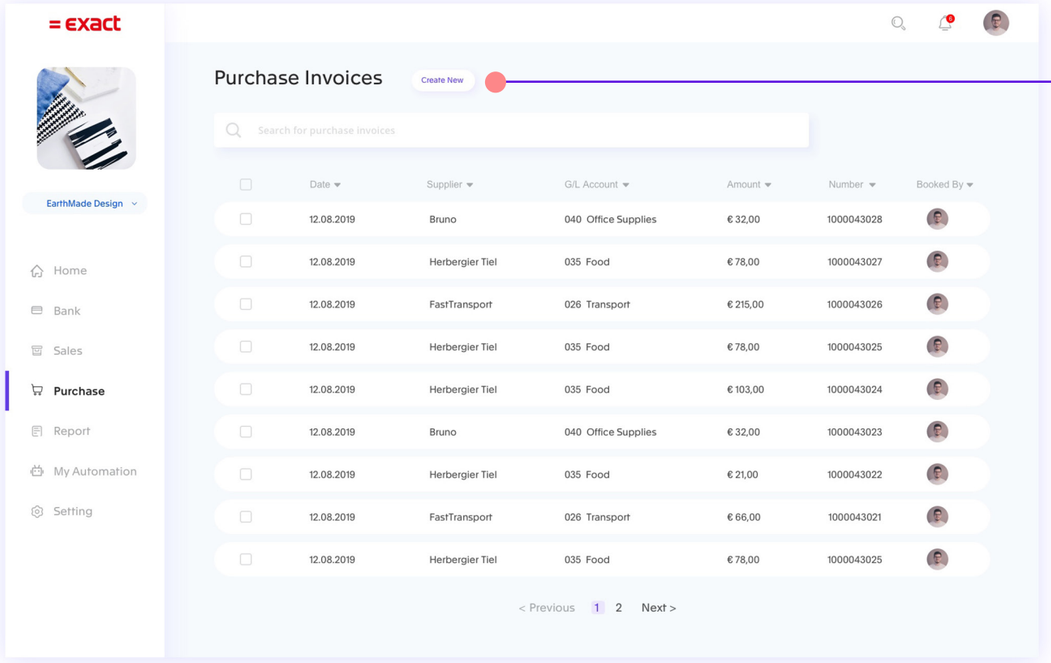



Figure 9.12: Purchase page – Learn & Suggest

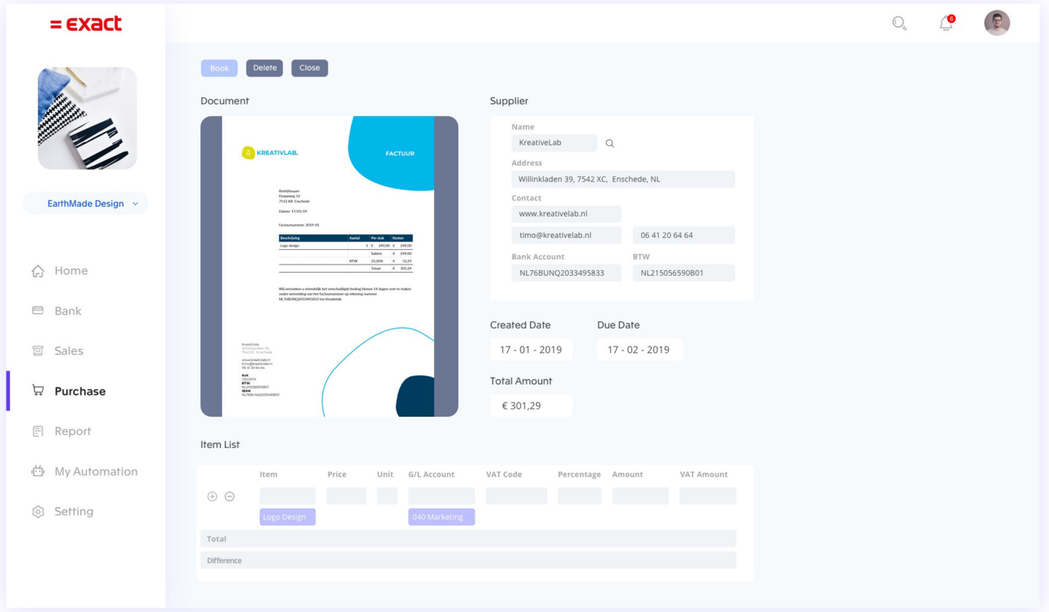



Figure 9.13: Create a new purchase entry with AI suggestions

When "Propose & Review" or higher level of AI is enabled, the purchase page will show more information about the automatically processed results from AI (see Figure 9.14).

On the top of the page, there shows three types of automatically processed proposals: completed invoices, incomplete invoices and invoices that are still being recognized. For completed invoices, users need to review and book them later. For incomplete invoices, users need to edit and fill in the missing information themselves. For recognizing invoices, the users could check the progress.

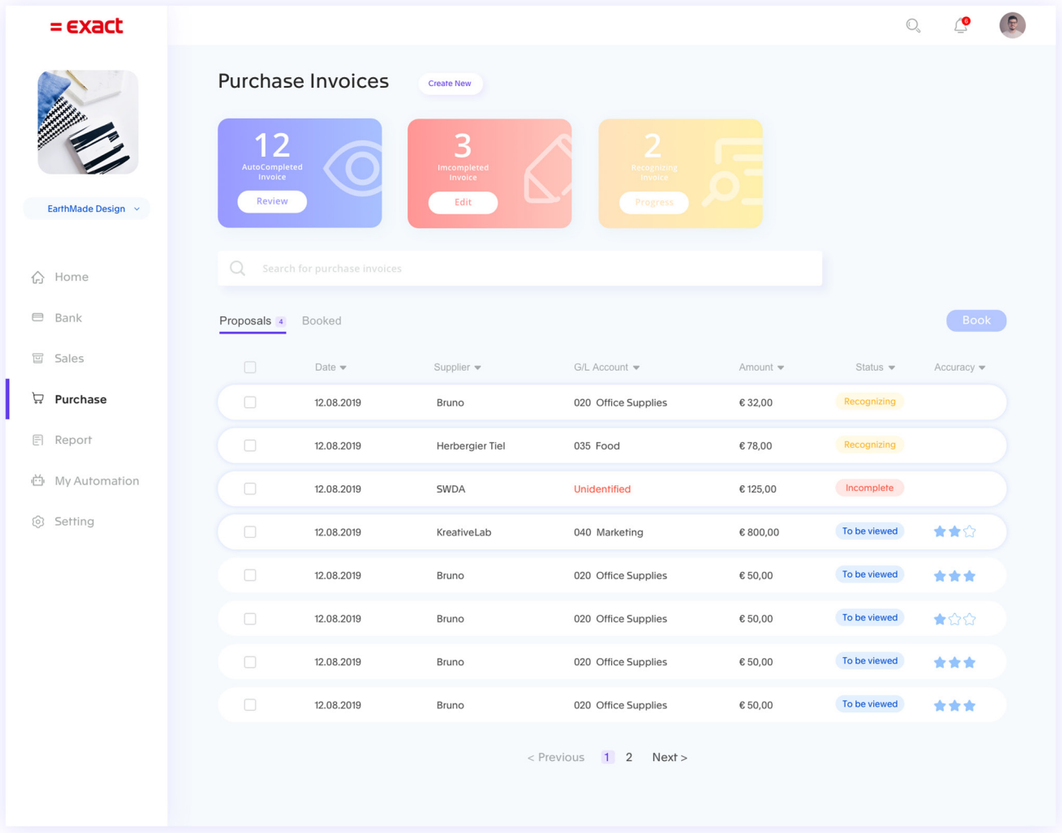


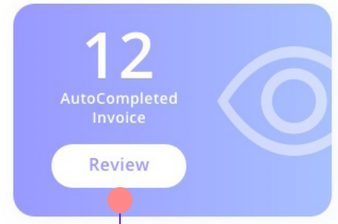

*Figure 9.14: Purchase page - Propose & Preview*





## Review Mode

When AI takes the manual work from people, users are changing their main role from entering to reviewing. Hence, an immersive review function is designed to fit this new way of working and give users an easy way to check and process the proposals. After clicking on the "Review" button, the user will go to the review mode.



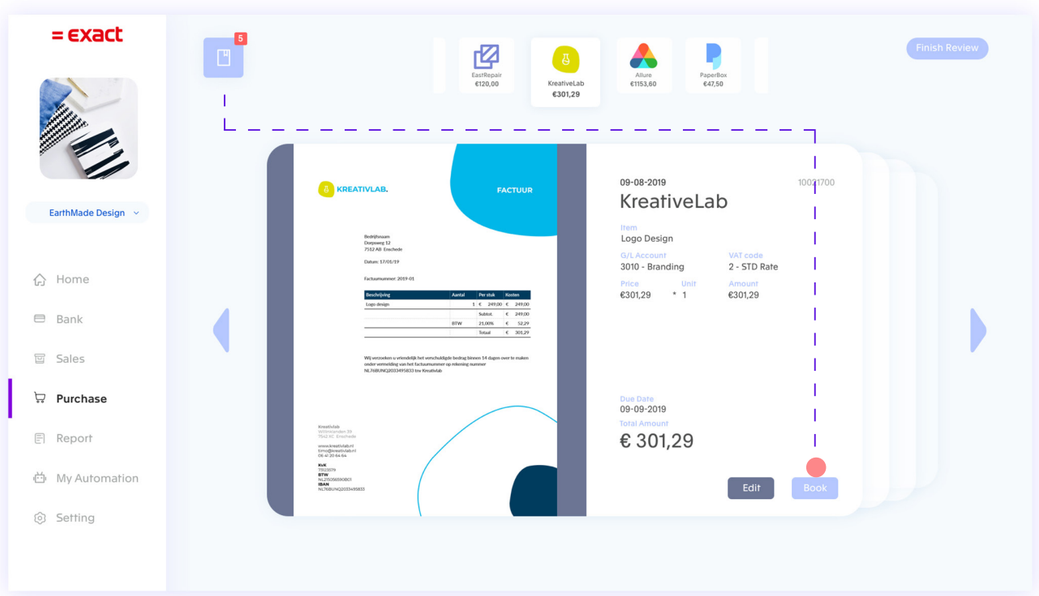




*Figure 9.15: Review Mode*

In the middle of the page there will be the main information of an entry combined with the invoice file, so that the user is able to check the result. When the mouse lingers on certain information of the entry, the counterpart in the invoice file will be highlighted.


If the proposals look good, the user could directly book them. An access to all the proposals the user chooses to book are able to be looked back in the booked "archive"

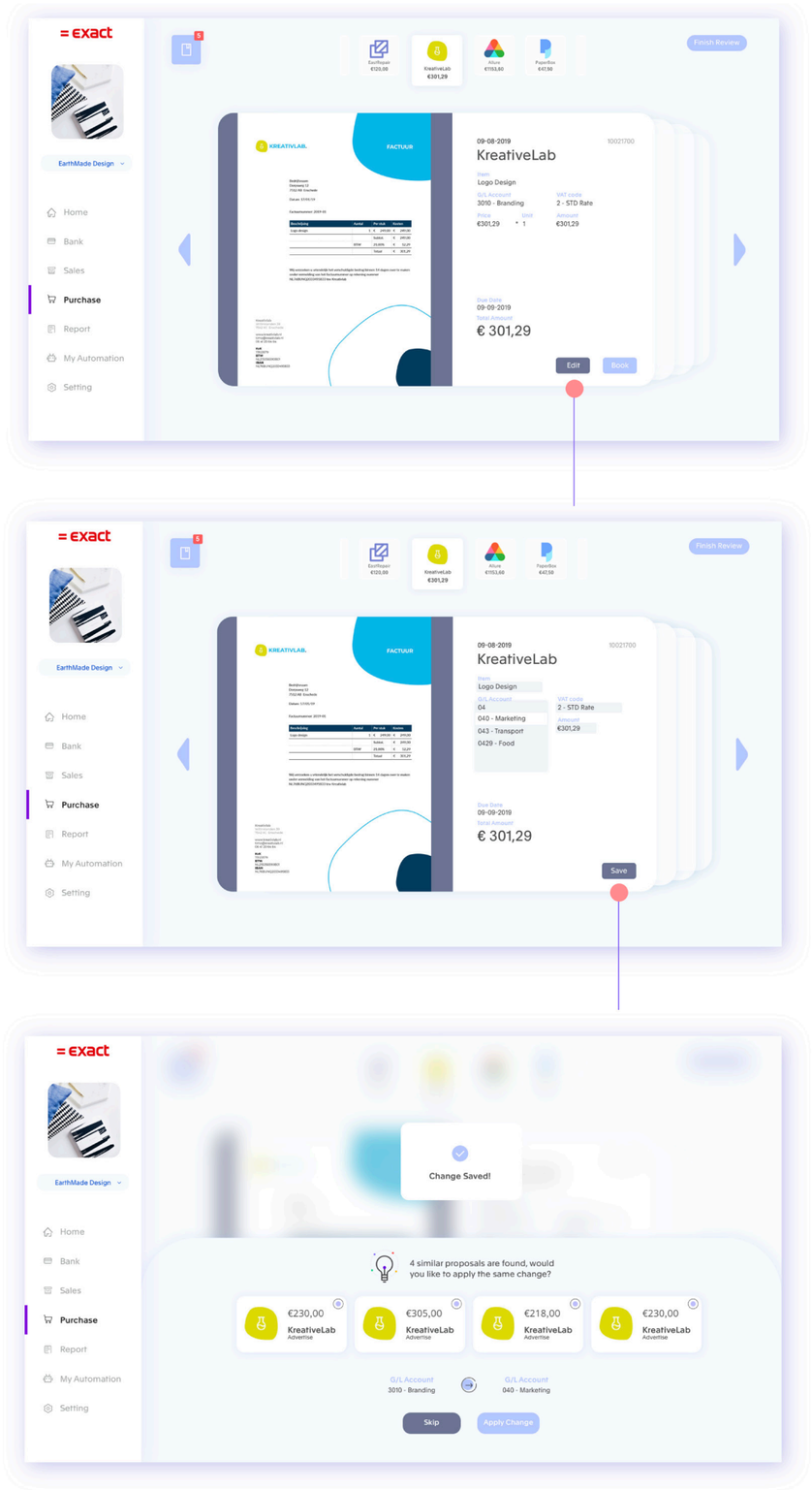



Figure 9.16: The process of editing the proposal





If the proposals have some mistakes, the user could edit the result and change it to the right answer.

Since AI is likely to make repetitive mistakes, a quick correction for all similar mistakes is designed. After the user saves an change for the proposal, the system will identify similar proposals and ask user whether they would like to apply the same change for these other proposals. Figure 9.16 shows the process of editing the proposal.

When the user finishes the review, there will be a pop-up shows how much is changed in the financial status (Figure 9.17). Then the user could see the most up-to-date information about the business.

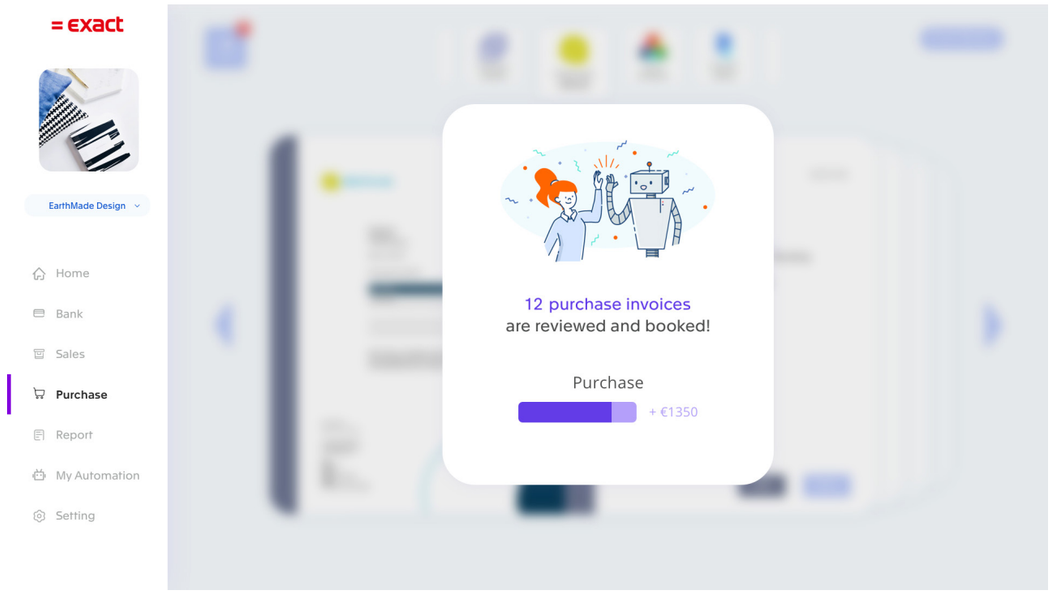



Figure 9.17: Finish review

## List of Proposals

In this section, all the proposals created by AI will show in a list. For each item, the basic information of the proposal as well as the status and accuracy of the result will be shown so the user could have a quick judgement on how much to trust on the result of each item.

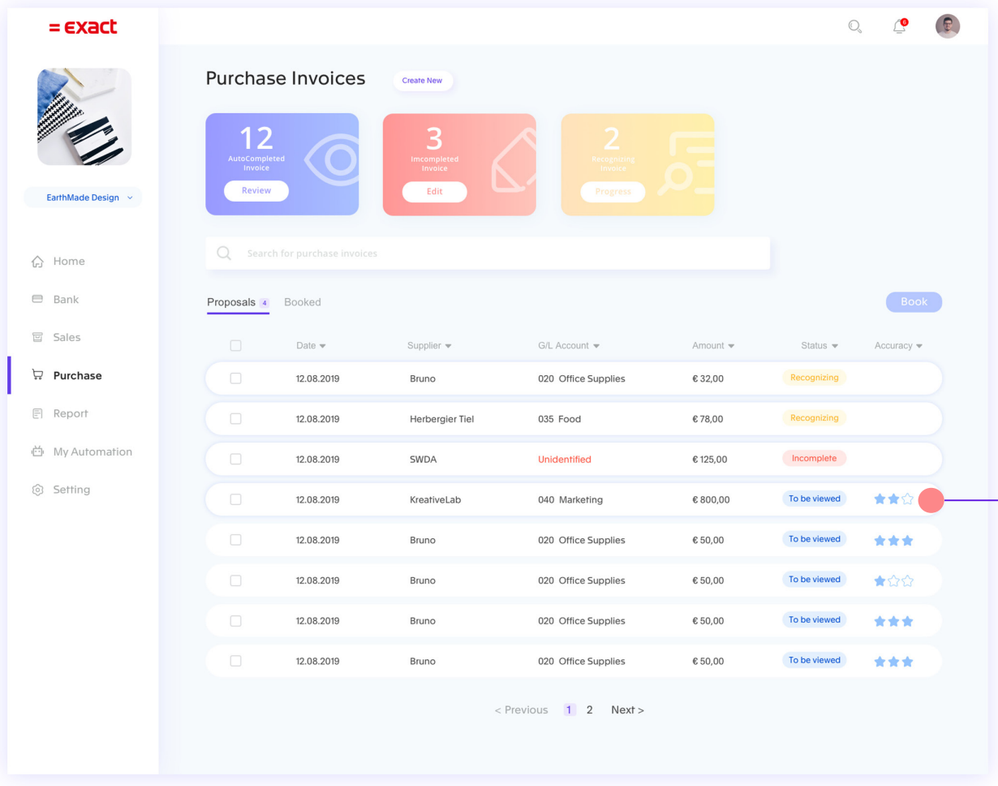



Figure 9.18: The list of proposals



The user could select the proposals that he trust and book them directly. If the user wonder why a certain item is not of high accuracy. He could clicks the item and then the detailed page of the proposal will be displayed (Figure 9.19). In the detailed page, the user will see explaination about the accuracy and the process of how AI proposed this result. By showing this information, the user could easily find out in which step AI might go wrong and identify potential mistakes quickly.

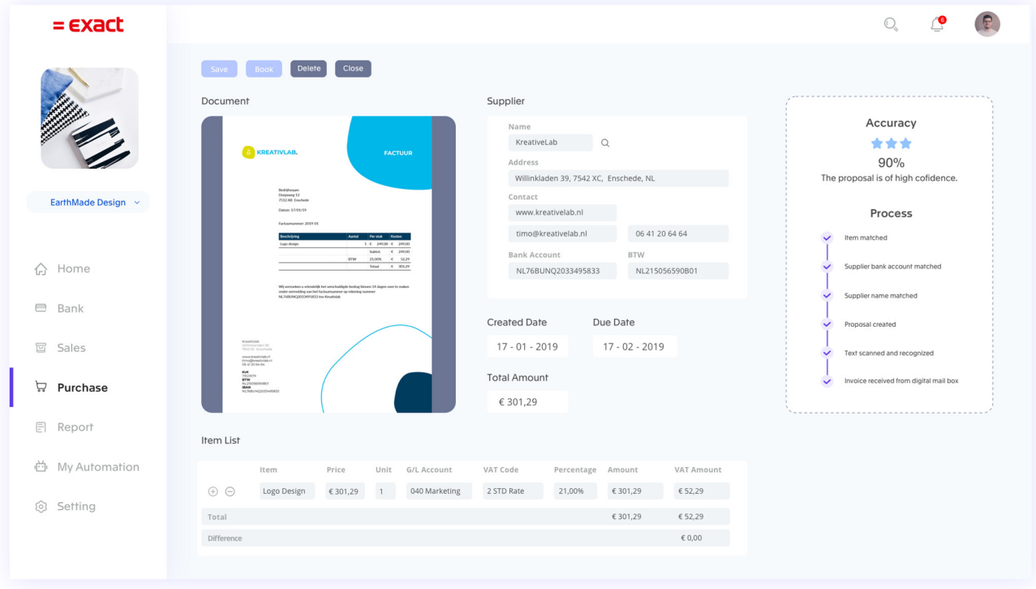



Figure 9.19: The detailed page of a proposal item

### List of Booked Entries

When the "AutoBook" is activated, users could identify which entry is booked by AI and which is booked by the user. Thus, when users need to look back for some booked statement, they could easily find which ones are from AI.

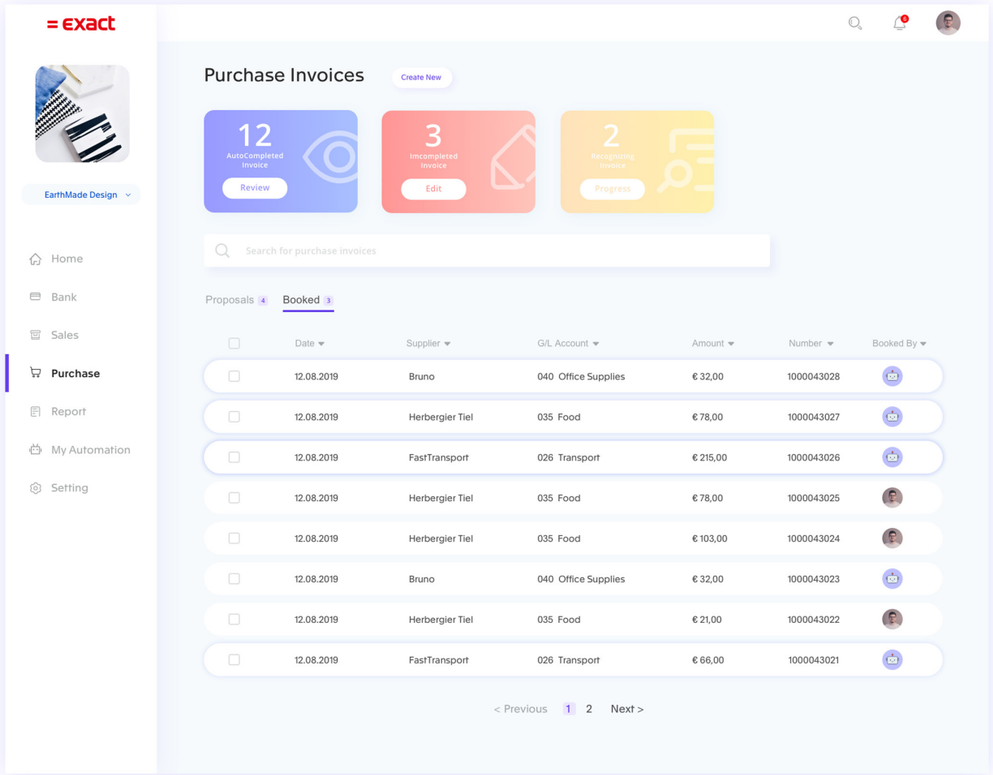



*Figure 9.20: The list of booked entries*

### 8.1.6 The interactive prototype

An interactive prototype is uploaded to the cloud. Please visit https://share.protopie.io/MwSdtawc4Rj to experience it.





# 9.2 Link with Trust Guideline

How is the design linked with the trust guideline? The following diagram shows the relationship between the design features and the trust-building guideline (Figure 9.21).

Besides, by creating a image of a AI robot, the feeling of collaboration with the machine is conveyed.

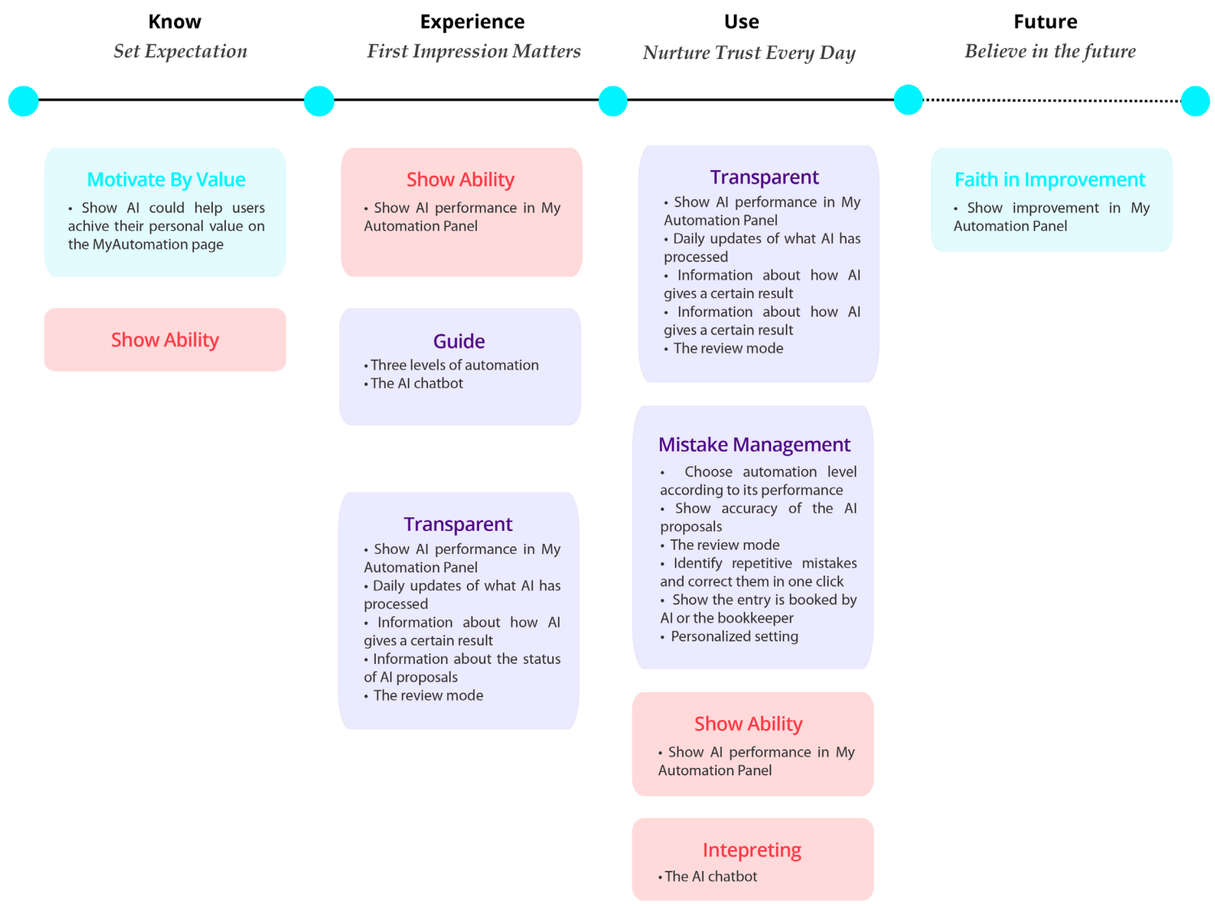



*Figure 9.21: The relationship between the design features and trust elements*

*Chapter 10*

# Final Evaluation

To evaluate whether the envisoned product fulfills the design requirement, testings with real users from Exact is applied. Besides the result of evaluation, there are also interesting feedbacks about how to improve the design.

# 10.1 Evaluation Set-Up

## 10.1.1 Goal

Evaluation sessions are carried out with Exact Online users. The aim of the evaluation is first to validate whether the design concept could fulfill the design goal and requirements propose in chapter 6.1.5, then also gather user feedback for future improvement. Based on the aim, based on the aim, research questions for evaluation is formed.

**General:**

- Generally, could the design concept improve your trust towards the AI functions?

- Does the design fulfill the trust-building journey guideline?

**My Automation:**

- Are the insights about AI performance interesting for you? Do you miss some information?

- Are the three levels of Automation logical to you and could help you get used to AI step by step?

- Do you think you have suitable variablities for the AI setting?

- Do you think the information provided and the AI chatbot could help you choose the AI setting that is suitable for you?

**Review:**

- Do you think the review-based workflow could help you better collaborate with AI?

**Information:**

- Do you think the information provided could make you trust and take proper actions to the result?

**Usability:**

- Is the design easy to understand and intuitive to use?

- How do you think of the design? What do you like and what do you think needs to improve?





## 10.1.2 Evaluation Set-Up


*Figure 10.1: The process of evaluation session*

Five users in total are recruited for the session, while three of them are accountants and two of them are entrepreneurs. Each evaluation session lasts for about one hour. It follows the procedure showed in Figure 10.1.

The session starts with an introduction to the project and the product. Then a pre-testing questionnaire is used to grade how the user expereinces with the existing version of Exact Online regarding the trust-building guideline. After the pre-testing questionnaire, the user will try the redesigned version of Exact Online with the instructions of scenarios. The user is asked to think out loud to speak out their feelings and thoughts. When the user finishes using the prototype, an after-testing quesitonnaire is to be filled. The two questionnaires have the same structure and questions to evaluate the existing and redesigned version of Exact Online regards to the trust-building journey guideline. In the end, the participant will be interviewed to get more feedback on the design concept.

The full instruction for evaluation is in Appendix 6.

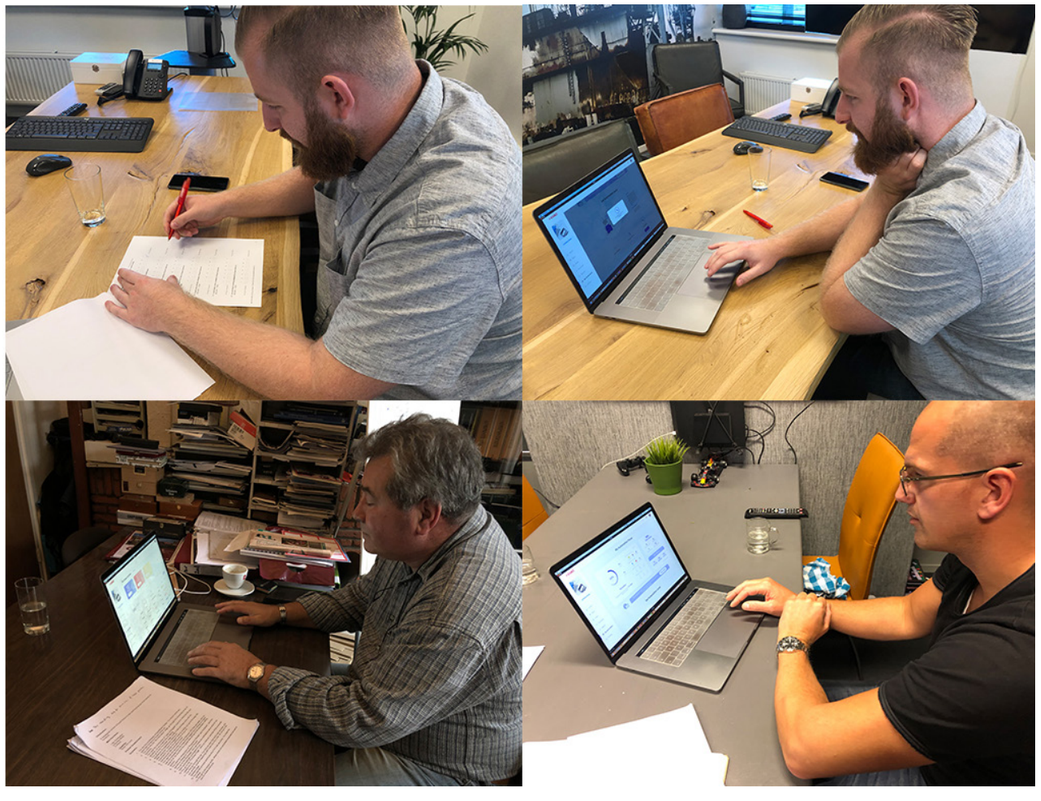


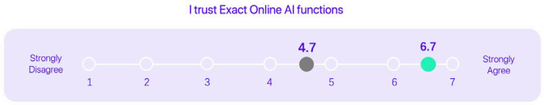
*Figure 10.2: Users testing with the redesigned version of Exact Online*

# 10.2 Evaluation Results

## 10.2.1 Results from the questionnaires

When compare the grading results from the pre-testing questionnaire and the after-testing questionnaire, we could answer the following questions:

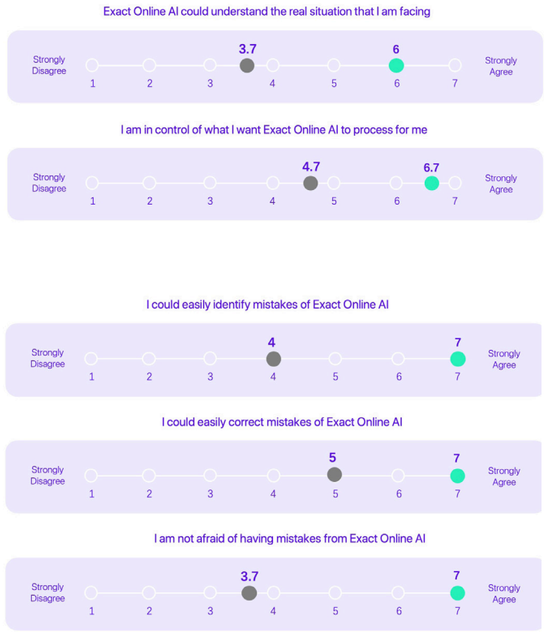
Generally, could the design concept improve your trust towards the AI functions?




The result to the statement "I tust Exact online AI functions" shows that the new design makes Exact Online much more trust-worthy than before by raising the score from 4.7 to 6.7.

Does the design fulfill the trust-building journey guideline?

According to the result, the average scores of all the trust elements in the trust-building journey are more or less raised after using the new product. Thus, we could indicate that the design fulfills the trust-building journey guideline. Some of the elements that have a relatively big improvement is showed:




We could see that the concept is making big improvement in the "Situation-Interpration", "Transparent" (a feeling of in control" and "Mistake Management".





## 10.2.2 Positive Results from the Interview

From the interiviews, the new design get many positive feedbacks.

### General:

*"I am really positive now. I have to be honest. This really is worth, I would use it."*

*"This really is what I'm really looking" forward.*

**Generally, the users are positive about the new design of Exact Online**, some users said they would like to see it really implemented.

### My Automation - Automation Panel:

*"I think it shows the good things."*

*"For me. It's just really interesting to see all because I like these things. I always go for achievements."*

Users showed interest in the inforamtion in the automation panel. What's more, by showing the performance in numbers and graphics, users might be motivated to together improve the performance.

### My Automation - Three Levels of Automation:

*"It goes through the same pages as I first start bookkeeping."*

The three levels of automation is logical, **the way machine learns and progess in the three levels is just like the way a person learn.**

### My Automation - Chatbot:

*It's a really friendly robot. It also gives a little bit of trust because its not like a jsut a program in the data center. It looks fun."*

The image of the chatbot makes AI **more humanized**, which also enhance the trust.

### Review:

*"It is really easy to adjust it if there is the correcting to be make. This is really helpful to me."*

**The review mode gives an easy check and correction to the proposals.** With the function to apply the same change to all similar mistakes, it is more easy for the users to change the repetitive mistakes made by machine.

*"It shows just enough. And not not too much."*

**The review mode provides sufficient information for the user to check** while still keeps a simple structure.

*"I like that it could go just book book book and done."*

What's more, users like **the quick interaction** of one-click book.

### My Automation - Personalized Setting:

*"I have several suppliers who I know the result is always good. It would save a lot of time if I could set to autobook it."*

The users like the variablity that they could create the personalized rules because **they are aware that AI could perform differently towards different financial administrations**.

### Information:

*"What I like is the information, for example, the accuracy, how does the AI come to the decision."*

The users think the information provided in the new design **gives them clues** about what AI has done and why there is a certain outcome. This also gives them more control.

### Usability:

*"I like this very much. Already. Because this is very easy to look at."*

Most users from the testing mentioned that the new design is **clear and simple**, which makes it much easier to use. In the same time, it still gives an overview of the company information that the users would like to see, and shows the important things immediately. What's more, the content in each sector is **understandable** for the users.

## 10.2.2 Deficiencies of the Design

Apart from these positive feedbacks that validate the design concept, there are also some points need further consideration in the design.

### General:

- **For accontants who are very cautious, they always want human interactions rather than go directly auto-booked.**

### My Automation - Three levels of Automation:

- **There might be users who will skip the first two phase of automation.** The entrepreneurs or accountants have a positive attitude towards AI might skip the intial levels of automatino and go directly to Autobook. Thus, think about other ways to guide them to get used to AI rather than going through the whole process of three level of automation.

### My Automation - Personalized Setting

- **Some users want more information about the personalized settings**, such as what VAT code would it use, what account would it goes to. This will give them more clearness and confidence about the setting.

- Some users also want to **set advanced personalized rule**, such as always assign the invoice from one supplier to a certain account.

### Review:

- **It would be nice to also highlight the potential mistakes in the review mode.** When reviewing the results, people could ignore mistakes. So highlighting the potential mistakes in the review mode would be helpful.

### Information:

- **The process showed in the detailed page of proposal is a bit unclear.** Try to elaborate how to explain how AI processes the invoice and gives an result.

### Usability:

- **There are diffrent preference between entrepreneurs and accouantants on the homepage.** The accountants might want to see "My Automation" as the homepage while the entrepreneurs like the business status of their company in the homepage.

*Chapter 11*

# Conclusion, Limitation & Recommendation

This chapter is the last chapter of the report. It will talk about reflection and future recommendations.

# 11.1 Conclusion

The project is to study the trust issue in AI, which is one of the most challenging topics now in AI application. Then the result should be transformed into a tangible design solution for Exact to solve the trust issue in their AI services.

There main outcomes and contributions of this project are addressed below:

### Modified trust model

In the literature review, two trust models are studied. Based on the theoretical structure behind the two models, a new trust model is proposed. The new model fits the context of developing AI applications and focuses more on the elements that will influence trust rather than the mechanism of trust formation.

### The framework of the trust-building journey

By integrating the mindset that trust is a dynamic process, the elements that will influence trust are mapped into different phases in the timeline. This framework is then named as the trust-building journey.

### Strategy for Exact to solve the trust issue

A strategy is proposed for Exact to help them solve the trust issue. The strategy contains four layers from abstract to concrete: vision, strategy, tactical layer and operationalization.

### A guideline/toolkit to provoke consideration about trust

A toolkit is designed to work as a design guideline or checklist for Exact. The toolkit aims to take the trust aspect into the development process of Exact AI features. This toolkit could also be used for other projects with some simple modification of the content which is specifically linked to bookkeeping context and Exact.

### Redesign of Exact Online

To evaluate the trust-building journey guideline as well as show tangible possibilities of the strategy, an envisioned version of Exact Online is created.





# 11.2 Limitation

This project has some limitations in the research, design, and evaluation phases.

#### Limitation of the context

In this project, most of the research is conducted in the context of bookkeeping, so the outcome may need modification if it wants to be applied in other industries.

#### Limitation of the domain

The research and design mainly focus on automation. Other AI applications such as prediction are not referred a lot.

#### Lack of deep understanding of financial administration

Before this project, I have little clue about what accounting and bookkeeping are. Though both desktop research, interview with accountants and interviews with internal experts of Exact are applied, the project still lacks a deep understanding of the financial process. This may lead to problems and mistakes in the redesigned software. Thus, the final redesign should more work as an inspiration rather than a mature product for bookkeeping.

#### Unclear about how to make use of the "trust persona"

The "trust persona" is first created to empathized with the users by thinking about the external elements of trust. However, it is still a bit unclear of how to make use of the "trust persona" for the AI development strategy .

#### Limitation in toolkit testing

The toolkit is designed to be implemented during the discussion of different stakeholders in the development process. However, due to the time limitation, it is hard to gather all the stakeholders in one testing. Thus only individual testing is conducted for the toolkit.

#### Insufficient participants for the product evaluation

Since it is not easy to recruit users from Exact to participate in one-hour testing, the number of participants in the final product evaluation is relatively low. Thus, the product design may need more rounds of testing to validate and get feedback.

# 11.3 Future Recommendations

Based on the reflection about this project, some recommendations are made for both future research and implementation in Exact.

## For future research

### Modify the toolkit before applying to other industries

Some of the content in the toolkit is specifically linked to Exact. So if the future researcher wants to use it for other projects, first check whether there is a need for modification.

### Think about what is the role of external elements

It is easy to create ideas according to the internal elements of trust formation because they are directly linked to product ability and design. However, when it comes to the external elements which are mostly environmental influencers or personal traits and attitudes, how could we take them into consideration for the design? This is an interesting topic to go on.

### Explore the trust issue of AI in more domains

This project is basically conducted in the context domain of bookkeeping and the technology domain of automation. AI technology has a wide range of applications in different industries and different functions (chapter 2.2), so there are still a lot of potential areas to explore.

## For Exact

### Take trust into account in the early phase

Once trust is disrupted, it is hard to recover. Thus it is important to take trust into account in the early phase.

### Iterate the design of the envisioned product based on the evaluation.

Though the main directions are validated to be useful for building trust, from the evaluation results, we could see that there are still some things to consider and to improve in the design.

### More user testing

To achieve a mature design of the final product, user testing and evaluation with more users is demanded.

### AI - based mindset

Exact Online is a comprehensive and complex system for financial administration. So now when developing new AI features, most of the time, it is only added on the existing system with the existing workflow. In the future, in order to create a consistent experience for users as well as to achieve innovation, it might be helpful to change the mindset to designing for AI-based workflow.

### Different versions for accountants and entrepreneurs

Due to the time limit, in this project, only one design of the final product is made. However, the accountants and the entrepreneurs have quite different working habits. In the future, it might be interesting to think about different versions for these two groups of users. Especially for the entrepreneurs, a mobile version should be considered since they prefer to do the bookkeeping on the way of on their couch.

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