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**NEW COMPETITIVENESS AND  
BUSINESS IMPACT FROM  
INTELLIGENCE, INTUITION,  
INTEGRATION AND INTERACTION**  
The final report of the NewBI5 research project

Faculty of Management and Business  
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# EXECUTIVE SUMMARY – LESSONS LEARNED FROM EACH CHAPTER

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**This report combines the results of different research streams in the NewBI5 research project into one package (NewBI5 = New competitiveness and Business Impact from Intelligence, Intuition, Integration and Interaction). NewBI5 focused on how managerial work could be supported by advanced analytics such as artificial intelligence (AI). The research project harnessed considerations of new technologies, such as AI, for managing international business growth among Finnish companies.**

The project took place in 2018–2021 and was coordinated by Cost Management Center (CMC) at Tampere University, Unit of Industrial Engineering and Management (Laine, Tiitola, Korhonen, Kuperstein Blasco & co.). The project involved an exquisite network of internationally renowned scholars and growth businesses from Finland. Core academics accompanying CMC were Signal processing (Kämäräinen & co.) and Social psychology researchers (Ruusuvaori & co.) from Tampere University. The companies involved in NewBI5 were ABB, Evondos, Integrata and Mobidiag (case companies), supported by a wider steering and dissemination group consisting of Fastems, HappyOrNot, Neste, Pinus, Quva and Vincit. The project was funded by Business Finland (the Finnish government organization for innovation funding and trade, travel and investment promotion).

Each of the chapters of this report provide lessons learned, which this executive summary consists of. In the following, the lessons learned from each chapter are presented in condensed form.

## **Human-based and technology-based management (Chapter 2):**

- **Make sure you understand the context of digitalization:** Digitalization is a context-dependent phenomenon that requires understanding about the actual processes that could be automated. Without such understanding, it is highly unlikely that implementation of new technologies, such as AI, will provide desired results.
- **Both explore with and exploit new technologies:** There are challenges in gaining efficiency through automation especially if people attempt to automate processes that are not programmable. Moreover, a focus on efficiency might cause people to focus only on today's tasks (exploitation of AI) and forget about the future (exploration with AI). This is problematic since we cannot know if today's problem formulations are relevant tomorrow. Indeed, both exploitation and exploration are needed. Without exploitation, there is too little focus – without exploration there could be too much focus.
- **Assign purposeful roles for humans and machines:** Human experts will remain relevant in the future as well, as they are needed to find new problem formulations for AI. The key is to identify in which parts of a manager's workflow human or machine capabilities are more purposeful and remember that a human is ultimately both punished and rewarded for task performance.

## **Artificial intelligence for automating or augmenting managerial work (Chapter 3):**

- **Listen to both experts (supply) and the future users of new technology (demand):** The expectations for using AI, and the resulting discourses we have, are not insignificant but can instead steer the way we think about using AI and how we end up using AI. By seeking to

utilize AI for sparking discussions rather than pursuing definite answers, managers and financial experts could start utilizing AI not to bring closure but open new debates by harnessing the power and speed embedded in algorithms.

- **Ensure that there is fuel for AI:** We need to provide AI with sufficient data to work on. Without data, AI is crippled as the algorithm cannot learn well enough or about the phenomenon it is intended to work on. Moreover, the data needs to be of adequate quality as well.
- **Focus on issues that matter:** AI should not be implemented just for the sake of having AI. If there is new business or other organizational benefits potentially available, AI could provide a powerful new approach.
- **Be open yet careful:** We should carefully consider the extent that we are automating or augmenting decisions and decision support. A too small role assigned to AI could lead to too small refinements of current practices or not revealing some new, more radical business potentials. A too large role assigned to AI might mean that humans lose their touch with issues they are responsible for.

#### **Using analytics for understanding and managing customer value to enable international growth (Chapter 4):**

- **Renew your operations with analytics:** New analytics and sources of data can enable new types of customer-oriented interorganizational management accounting approaches.
- **Remember that the customers will provide an ultimate test for value potentials:** The actions of customers have a significant role in the creation of customer value. Analytics might help companies show how new technologies (such as equipment) function as parts of customers' processes. This way, companies are able to communicate value-in-use potentials even in complex product-service-systems.
- **Nurture value actively:** Customer value creation can benefit from or even require active management. Without active participation and facilitation from the equipment supplier, some of the value potentials might not be realized at the customer. However, when companies assume an active role in supporting their customers' value-creation, business renewal can stem from unexpected directions that the customers would not necessarily identify by themselves.

#### **Decision-making as a part of managerial work (Chapter 5):**

- **Consider how even non-routine decisions can be supported by elaborate analytics:** Sometimes there are multiple tools available for decision support, whereas occasionally decisions are made based mostly on human intuition or judgement. There are no one-size-fits-all AI applications for non-routine decisions, but analytics may provide inspiration.
- **Acknowledge the path-dependency of AI-related decisions:** Decisions in complex business networks take place in a path-dependent manner. Thus, a careful implementation of AI for decision support allows flexibility and helps avoid technological lock-in.
- **Focus on critical incidents on the path to a decision:** Critical incident techniques help reveal dynamics behind decision-making by gathering information through respondents' accounts of events that happened.
- **Be curious about decision outcomes to learn:** Try to understand why a customer either decided to use your product or service, postponed the investment, or selected a competitor's solution instead. This way your organization can learn for sealing possible future deals.

#### **Enabling control – supporting the actors involved (Chapter 6):**

- **Make sure that everyone understands the rationale of performance in the organization and is able to observe it:** if an employee cannot see why their work is important, they will hardly feel enabled to give their best shot.
- **Make sure that everyone is supported and dares to be oneself and use one's capabilities and potential at work:** if an employee is coerced by organizational influence rather than enabled by it, much of the potential might be missed. An employee that feels that their potential is important as it is an asset!
- **Make sure that there are avenues and mechanisms to think and act beyond the current boundaries and performance indicators:** sometimes current ways to influence employees might lack a viewpoint, be imbalanced, or work counterproductively. Then it is important that managers have the opportunity to repair non-functioning control practices.

**The choice and use of novel and relevant research methods (Chapter 7):**

- **Develop method wisdom:** Refining suitable approaches and methods based on context specific understanding seems to foster novel and relevant research findings.
- **Embrace multi-disciplinarity:** Multi-disciplinary research projects require extra attention to identifying the interesting and relevant research questions and tailoring the approach accordingly.
- **Focus on real-life business problems:** The focus on participant organizations' business potentials serves typically as a fruitful basis for research efforts.
- **Seek impact:** The more interesting the unit of analysis is for the participant organization, the more effort can be taken by it and thus, the more results may stem from the research project.

**Concluding remarks (Chapter 8):**

- **The project studied the management and organizational practices, featuring both human and technology-based advancements.** The project focused on different means of analyzing and enabling decision-making towards extended value generation, and thus towards new opportunities for business growth.
- **The project was directly involved in certain relevant, prioritized business development avenues of the organizations involved.** The research project built capabilities for those business development potentials, helped identifying and refining them, and eventually, through interventions, helped realizing some of them.

# FOREWORDS

This report summarizes and elaborates upon the multi-disciplinary NewBI5 research project. The project enabled us to conduct research on timely and meaningful issues concerning management and leadership, in connection with important human and social aspects as well as continuously evolving technical possibilities. During the project, the perspectives of Industrial Engineering and Management, Social Psychology and Signal Processing were continuously reflected upon to build and foster common understanding, as a basis for novel and relevant research outcomes.

The project was enabled by the remarkable funding of Business Finland as well as Tampere University and participating companies. The authors are extremely grateful for this support. Furthermore, there were remarkable support for the project from the project stakeholders in terms of their research and development projects, cases, direct project support and information exchange. There were more than 10 organizations directly involved in the project and several more indirectly as the customer cases, pilots, participants of the interviews, visiting speakers as well as participants of the seminars and other occasions of the project. Our warmest thanks to all those organizations and their representatives as well.

The multi-disciplinary project was enabled by several individual researchers in the three teams at Tampere University, which is here gratefully acknowledged (so thank you Teija Ahopelto, Sanni Tiitinen, Natalia Saukkonen, Nataliya Strokina, and everyone doing your Master's thesis along with the project). Furthermore, we had the opportunity to extend the collaboration with other domestic and international colleagues. Despite the Covid-19-related challenges in terms of planned international exchanges, the international network especially supported by the Aarhus University team and many others deserves huge thanks. With the help of Zoom and Teams and other technical enablers, also the international collaboration was surprisingly active and fruitful during NewBI5.

This report provides insights into the lessons learned from the project. Beyond the report, there are several existing publications and forthcoming publication processes. Before that, there are several opportunities that the project has opened in the participating organizations. Such opportunities will continue to create business impacts in the future. The research team strongly believes that NewBI5 has increased knowledge and capabilities which can be realized in the forthcoming projects.

Thank you for the interest in the project. We wish that the report offers you inspiring learning possibilities.

Tampere, 9.3.2022

The authors

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# 1. INTRODUCTION

## 1.1 Humans and machines together – an age-old theme renewed?

What if 25-30% of managerial work were automatized in the future? How could we recognize the managerial activities replaceable by artificial intelligence (AI), and understand, evaluate and manage the related business potentials for savings, value, and impact? At Tampere University, the NewBI5 project (2018-2021) examined how, why and where managerial work and managerial processes would change with the help of automation, AI and advanced analytics.

The acronym NewBI5 comes from “New competitiveness and Business Impact from Intelligence, Intuition, Integration and Interaction”. The project drew from cognitive biases that could hamper human decision making and sought to find new ways to overcome such biases by humans-machine collaboration. The cognitive biases to overcome were:

- “What should we remember?” overcome by **Intelligence**
- “Need to act fast” overcome by **Intuition**
- “Too much information” overcome by **Integration**
- “Not enough meaning” overcome by **Interaction**. (Benson, 2016)

To understand how intelligence, intuition, integration and interaction were put into use for making business impacts, NewBI5 focused on the following viewpoints:

- 1) The thorough and multi-disciplinary understanding about managerial work opened up new possibilities for new services and new kinds of value impacts.
- 2) AI and advanced analytics directly supported the emergence of new activities, services and value impacts (facilitating offering development by better understanding of demand).

In all, the project aimed to discover how AI, in supporting managerial work, could help understand the demand of new services and their business potential.

The area of humans and machines working together, is not new, however. The definition of the boundaries between human expertise and AI has been a long-standing debate (Autor et al., 2003), but this debate is far from closure, particularly now when new applications of AI have started to emerge (Malmi, 2016). Even if we focus on how AI and humans can cooperate – many, and quite useful thoughts have been proposed. There are a plenty of studies on how AI might function detrimentally as it might miss understanding of context and thus detach an analytical exercise from the meanings embedded in decision-making (already Eloranta, 1986; and later e.g., Autioniemi, 2020). Or, if the production of numbers is detached from the context in which they are later used, the result might be a quick but wrong decision made (Quattrone, 2016). In all, it has not been clear how AI could support managerial work that consists of both decision-making and less-formal understanding of the operational environment (Hall, 2010).

This is where NewBI5 came into the picture. By drawing upon real-life business cases of developing capabilities of utilizing advanced analytics for generating business impacts, the NewBI5 project was able to discover new problem formulations regarding the value of AI for thriving companies that seek new ways to support their growth initiatives. Throughout the journey, NewBI5’s researchers were able to uncover fundamental aspects of human work and machines supporting the work of humans.

This report is a documentation of that journey as it summarizes some of the key results of the project. The report also attempts to give practical guidelines for business practitioners that are wondering whether they should invest their time on exploiting AI or exploring with it. Next, we will

go through some practicalities related to NewBI5: the research problems addressed and the project network.

## 1.2 The research problems addressed in the project

Our first research problem (1) was: **“How can new (financial) management processes be implemented supported by new automatic, learning systems?”** This research problem was very business-oriented and lead to complex managerial challenges. These challenges were highly interesting also from the theoretical point of view. To solve the research problem, the project needed to discover what kind of actual and expected changes would follow regarding people and business impacts after AI is introduced to business management. In the future, AI will be a natural part of the economic understanding<sup>1</sup>, but this role is still unknown (Jakobsen et al., 2017; Korhonen et al., 2021b).<sup>2</sup>

The project therefore examined the ways in which AI can be implemented into actual practices and processes – under different contextual characteristics. In other words, there are some general conclusions that could be drawn from automation of expert work withing financial management related tasks. Some finding, in contrast, are more idiosyncratic, and it would be important to understand the drivers of such idiosyncrasies; for example: how automation of certain parts of managerial work can either provide something useful or not. Indeed, solutions for analyzing data and further foresight for decision-making are different in different companies, which means that also the financial implications of AI solutions need to be examined on a case-by-case basis.

To understand this issue, we continued to our second research problem (2): **“In what kind of support roles could automatic, learning systems be in the business managerial work of individuals and groups?”** To address this problem, the NewBI5 projects needed to discover the consequences of a possible role change (human vs. machine) in leadership issues. The project therefore examined the elements of value that AI could bring into managerial work and leadership. If there is no value, why would AI be implemented? Or, if there is an idea that there is value in implementing AI, how would this value be understood and later realized?

Altogether, these research problems enabled NewBI5 to seek new roles for humans and AI in managerial work – contributing to skillsets needed from experts in the fields of financial management, operational management, and human resource management (Payne, 2014; Arnaboldi et al., 2017). For such wide areas of contribution, also a variety of different research skillsets were needed: the research network is presented next.

## 1.3 The network of the research project

NewBI5 did not see AI in isolation; it provided unique multi-disciplinary approach at Tampere University: including business (Cost Management Center, CMC), technological (Signal processing, SGN) and social science research (Social psychology, SOC). This network of researchers worked in cooperation with world-class international management scholars (Aarhus University, Denmark; Aalborg University, Denmark; Scuola Superiore Sant’Anna Pisa, Italy; The University of Auckland, New Zealand; and University of Innsbruck, Austria). Each member of the network had a unique set of skills needed to address the research problems be it profitability management, artificial intelligence, human interaction, management control or management philosophy – i.e., aspects related to technological or human side of managerial work.

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<sup>1</sup> see e.g., Fakta, 10.4.2018: “Tekoäly Alicia T neuvoo, muttei päättää”. (Engl. “Artificial Intelligence called Alicia T instructs but does not decide”) (Available at: <https://www.talouselama.fi/uutiset/te/e46a047c-9a2d-3143-accd-1ecfaaa9e892?>)

<sup>2</sup> The role question still remains in the society even after the project, see, Helsingin Sanomat Visio, 27.11.2021: “Kun tekoäly pettää lupaukset” (Engl. “When AI fails to meet its promises”) (D16-D17)



In the core of the project were the case studies: there were four innovative company networks (those of ABB, Mobidiag, Evondos and Integrata) and a wider company partner group covering ICT, services and manufacturing (Quva, Neste, Fastems, Vincit, HappyOrNot and Pinus). NewBI5's interventionist (i.e., deeply involved, development-oriented and practice-driven) approach yielded tangible results for creating new AI business competence in Finland and enabling profitable international growth in the networks under analysis and beyond. *Figure 1* illustrates NewBI5's network.



*Figure 1* NewBI5's network.

The studied environments were suitably different from each other: e.g., their technological maturity, product ranges and customer bases were different. Therefore, these environments were particularly suitable for exploring a broad range of potentials and pitfalls concerning AI and advanced financial analytics in/for managerial work. What is common to all the case organizations, is that they all seek international growth for their business.

The project was funded by Business Finland (the Finnish government organization for innovation funding and trade, travel and investment promotion). We are so very grateful for Business Finland for the important funding that made possible acquiring all of the NewBI5's results.

## 1.4 The structure of this report

The report is organized in chapters each of which will tell a story about the NewBI5 project from a distinct angle. The chapters do not, hence, present the project chronologically but thematically. We hope that by reading this report, you will learn something new. During the project we learned a lot and we now wish to disseminate some of these learning points. Each chapter, therefore, ends with lessons learned (those were summarized in the executive summary). Each chapter will tell a story that is related to the *Figure 1* network following the overview presented in *Figure 2*.

First, Chapter 2 gives an overview of the nature of both human-based and technology-based management work, the details of which will be discussed more in depth in later chapters. Chapter 3 focuses on the analytics and accounting systems and how the introduction of AI can either automate or augment parts of the management support systems. Chapter 4 provides a meaning for these analytics, elaborating on how we have been focusing more and more on understanding

the mechanisms of customer value creation and how we can also influence it as service and product providers to gain new opportunities for both national and international growth. Then, in Chapter 5 we look more on how and if these analytics can support the decision-making of organizations and in Chapter 6, we discuss how we could mobilize these decisions in practice through control systems and do this in an enabling instead of restricting way. Finally, Chapter 7 elaborates on the opportunities in research collaborations between companies and universities.

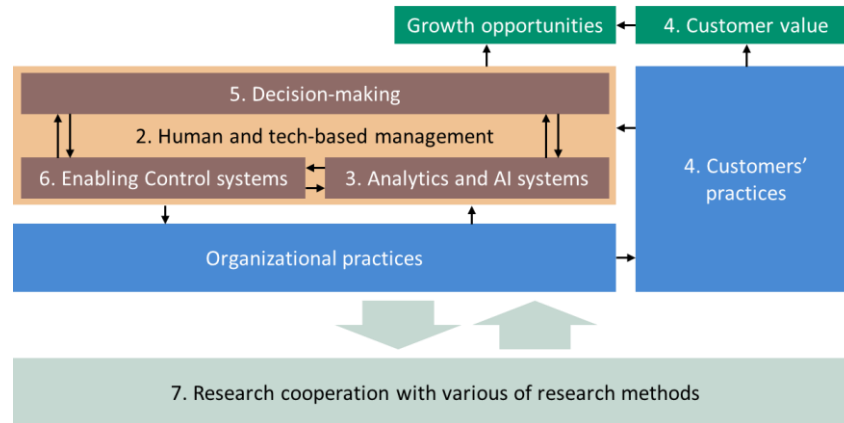


Figure 2 The structure of the report.

Especially, the chapters will contemplate on the following phenomena and issues:

### Chapter 2 Human-based and technology-based management

The chapter discusses how, on the one hand, the task-dependent environment directs the use of AI in managerial work, and on the other hand, technologies need to also serve experts' work that is not characterized by clear tasks.

### Chapter 3 Artificial intelligence in automating and augmenting managerial work – Balancing humans and technologies with a purpose

The chapter first conceptualizes AI and then examines how analytics can be used for new business growth identification (human resource analytics development) and productivity gains (healthcare organizing).

### Chapter 4 Using analytics for understanding and managing customer value to enable international growth

The chapter examines the linkages between customer value and new technologies, such as AI, that are implemented into existing processes (often at customers).

### Chapter 5 Decision-making as a part of managerial work

The chapter contemplates decision-making and critical incidents on the path towards business impacts.

### Chapter 6 Enabling control – supporting the actors involved

The chapter introduces the concept of enabling control and contemplates it in relation to digital and multi-spatial work.

### Chapter 7 The choice and use of novel and relevant research methods

The chapter takes a closer look at purposeful research methods for phenomena such as change, digitalization, and impact management – all of which offer fruitful yet complex research objects.

### Chapter 8 Concluding remarks

As the name implies, the chapter draws together our key findings from the NewBI5 project.

### Chapter 9 Project publications and dissemination

Finally, we offer an extensive list of publications that have been published during the NewBI5 project. The publications are categorized under chapter headings, so there is an easy-to-access list for further readings.

## **2. HUMAN-BASED AND TECHNOLOGY-BASED MANAGEMENT**

### **2.1 Why are human and technological aspects relevant for managerial work?**

The NewBI5 research project was initiated to support managerial work that aims at long-term international sales growth. We approached this managerial work from a dual perspective. On the one hand, managers often use technologies to fulfill certain information demands. Such demands could be related to, e.g., market position, operational management, or well-being of employees. On the other hand, and as the latter one of the previous examples implies, managerial work is not only management of markets or operations, but also involves leadership of humans. For this reason, managers interact with their colleagues, superiors, and employees – meaning that to be a manager most often requires also a humanistic approach. To manage assets or processes is, however, different from leading people. In this chapter we focus on the technological and human aspects of managerial work, and not on leadership. The two are, of course, intertwined, but since the word leadership does not grasp well the daily activities of managing assets and processes (but focuses more on leading people to a certain direction), we use the word management to depict the phenomenon studied.

Whereas both leadership and management can surface at any organizational levels, management of “issues” rather than leading “people” is to us a rather everyday task that almost any employee does almost every day: they might manage themselves, they manage to carry out a task, or they manage cooperative efforts with other. However, there are certain individuals that are called “managers”, by title even, and their work comprises mostly of managerial work (often making decisions and understanding the operational environment, as in Hall, 2010; and managing the assets that are required to perform a task for which a manager is responsible). For these people, the managers, it is important that they are informed: that they know what needs to be known, and when it needs to be known, with adequate precision and ease. Of course, sometimes, the managerial work task is less directed by the search for knowledge or information but solving a difficult problem about which not much is known – it might even be unknown what needs to be known. Hence, the acute task that a manager faces sets many boundaries for the manager, how they interact with others and how they use technologies.

The NewBI5 project sought to understand this side of managerial work as well. In all the four case studies (Integrata, Evondos, ABB and Mobidiag), quite naturally, both human-based and technology-based management were relevant. Moreover, we carried out a conceptual analysis of what it means to be directed by a task when utilizing AI technology. In the following we will highlight some of our key findings during the project.

### **2.2 Task-dependent environment directs the use of AI in managerial work**

The NewBI5 project yielded a publication that conceptually examined, in a leading journal, how AI utilization is framed by the task dependent environment (Korhonen et al., 2021a). The idea behind this publication is that each employee has a set of roles and responsibilities within an organization. These roles and responsibilities inevitably influence this employee’s personal worldview, and hence how they see possibilities ahead of them (Nørreklit, 2017). For instance, if a manager’s task is to allocate human resources to perform certain activities (scheduling), they are likely to see problems within the framework of accomplishing this task. Hence a new technology, such as AI, might offer them a way to address these problems guided by their task accomplishment. In contrast, it is very difficult to let go of one’s roles and responsibilities and – as the saying goes – think outside the box.

Let us consider a police officer as an example, since it is a work task that is known to most people. If the officer's task is to patrol around a block, their problem formulation is likely to be linked to patrolling. Or, in case this patrolling officer's commanding officer is considering AI opportunities, she or he probably is first and foremost seeking new ways to support the patrolling officers (and other officers of course) in fulfilling their tasks. This behavior that is guided by the task-dependent environment of today leads to a dilemma: because we cannot know what happens tomorrow, strengthening the capabilities to address the problems of today will not necessarily contribute to organizational success in the future. It might even be that increasing the capabilities to patrol the streets more efficiently by the help of AI could make the police organization blind to some yet unknown threats that are not in the sphere of any of the types of officers in the current organization. In other words: giving the patrolling officers AI support that could help them perform their task better and more efficiently would not solve the problems that are not yet on the task list.

An elaborate conceptualization of this example is presented in the abovementioned publication Korhonen et al. (2021a). Of course, the example is a simplification for descriptive purposes. A patrolling officer's daily list of tasks is as non-predictable as anyone's future – the officer might face virtually any kind of service request, from the classic save-a-cat-from-the-tree task to identifying-a-cyber-criminal type of task or an acute crisis situation that requires exquisite situational awareness, nerves of steel, and a heart of gold. Actually, few work tasks are as simple as they seem from an outsider's perspective – this is another key learning point in the NewBI5 project: automating a seemingly simple task by utilizing technologies might not just attempt to replace the work done by a human, but the human as well which is quite impossible, at least at the moment (Korhonen et al., 2021b). For this reason, it is very important not to draw hasty conclusions about a task environment without thoroughly analyzing what that task environment actually consists of (e.g., materials flows, activities, people and interactions). As the publication by Korhonen et al. (2021b) proposes, seeking efficiency through automating expert work might lead to parallel processes once technology might not offer as credible decisions than a known expert does.

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*“Actually, few work tasks are as simple as they seem from an outsider's perspective”*

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Consider a business manager then. Is the manager any different from a commanding officer? Does the manager have the ability to “explore” new possibilities instead of just focusing on “exploiting” AI in solving today's problems? Again, let us take an example, now a warehouse manager. If the warehouse manager seeks to start utilizing AI, she or he is likely to see warehousing problems that could be solved by AI implementation, making the warehouse more efficient and profitable. The Covid-19 pandemic showed us that however efficient and profitable warehouses were before the pandemic, because of implementation of production philosophies such as Lean, when systemic disruptions in supply chains take place, warehouses run into problems of part availability. Thus, had there been AI guiding warehousing problems before the pandemic (and most likely there have been many kinds of AI implementations in warehouses) it might have been difficult for these AI algorithms to build resilience against systemic shocks in part availability while at the same time optimizing the warehouses based on past data on part availability, demand and supply information, and for example seasonal price fluctuations. Indeed, the task-dependent environment of today shuts our eyes from problems that we do not recognize, and therefore, it does not necessarily encourage us to explore with AI. However, there are promising avenues for AI exploration when managers identify specific tasks that are too challenging or work intensive for humans to perform and that could benefit from computational support.

Indeed, once there has been exploration of the possibilities of AI, the most promising tasks can be selected for exploitation, and further exploration can be initiated. The task-environment, though possibly occasionally frames thinking about the opportunities of AI, also changes over time and inspires new opportunities for exploration and exploitation of the technology. Exploitation of AI is the prevalent mode in operative management of activities: exploitation of AI helps people refine existing solutions, choose and select between alternatives, produce things, seek efficient activities, and implement and execute decisions (March, 1991). When we turn our gaze at research and development and innovation activities, the situation might be totally different, as exploration can prevail. We go to this next.

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*“exploitation of AI helps people refine existing solutions, choose and select between alternatives, produce things, seek efficient activities, and implement and execute decisions”*

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### 2.3 Serving experts work not characterized by clear tasks

Exploration means that people search new ideas and phenomena, embrace variation, take risks, experiment, act flexibly, and essentially discover new things by being innovative – even engaging into types of play (March, 1991). In business practice, exploration means approaches that are not directed by clear-cut task. Thus, exploration might concern new business ventures, new product or service concepts, or e.g., new ways of organizing activities.

In NewBI5's data, focus was on exploring new business opportunities from available data that accumulates in firms' information systems during their service provision. Seeking new ways to explain complex phenomena at firms' customers is an open task, rather than a clear-cut task. There is data and the task is to explore the possibilities of that data to grow business.

A company might have masses of data, but it was might not be clear which tasks could be supported by analyzing this data. There could be a treasure hidden behind all the data, but the type or nature of this treasure might not be known.

The important, yet difficult aspect about exploration is that one cannot know whether they find the treasure or not. Hence there need to be enough resources to bear the possible missteps that most probably will result from taking risks and take the first steps on a new path. However, without new paths, the known paths (of exploitation) might overshadow the ones that might reveal a pot of gold (by exploration).

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*“without new paths, the known paths (of exploitation) might overshadow the ones that might reveal a pot of gold (by exploration)”*

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### 2.4 Lessons learned

To summarize this chapter, we outline three key messages. These messages will convey the idea that managers with ideas to exploit AI might wish to remain *ambidextrous* which means that they would be able to both *exploit* AI and *explore* with AI (Korhonen et al., 2021a). Essentially, managers should understand what digitalization means in their context and how new technologies (such as AI) could help provide efficiency for programmable tasks.

#### 1. Digitalization is a context-dependent phenomenon - Make sure you understand the context

When digitalization, or even AI are discussed, it is clear that they hold a lot of potential for improving task performance in different sectors (including private, public and non-government organizations). However, many tasks are more complex than what they initially seem if one looks at them

from a distance. It is hence important to understand (more broadly) the context in which digitalization shapes practice and (more specifically) in which AI is expected to support managerial work. Without understanding the tasks, attempts to automate activities that are not fit for automation might occur. For instance, if someone attempts to replace a mundane task by automation, one might fail to understand that what they intend to do is not to only replace a human's task, but replacing that human as well (Korhonen et al., 2021b).

## **2. There are challenges in gaining efficiency through automation - Both explore and exploit new technologies**

Automation is a positive thing. It allows us to relieve humans from performing tasks that are either dull (such as tightening bolts, as in Chaplin's *Modern times*) or potentially harmful or even dangerous for humans in the long run (such as performing an unergonomic task many times or lifting a heavy object) or that require capabilities that surpass those that humans possess (such as high-precision robotic welding, laser eye surgery, or going through thousands of books in one second). However, not every task is fit for automation. It is clear that some tasks will be more efficient when automated (e.g., by production automation or robotic process automation), but not all tasks, and not all tasks the same way. Taking efficiency as a goal might lead either to focusing too much on today's task environment (Korhonen et al., 2021a), or to creating new parallel processes that cannot replace humans but only consume more resources, necessitating double work of first utilizing technology and then making sure that technology performed adequately well (Korhonen et al., 2021b). However, both modes are needed: without exploitation, there is too little focus – without exploration there could be too much focus.

## **3. Human experts will remain relevant in the future as well - Assign purposeful roles for humans and machines**

As not every task is not fit for automation, there are areas in which humans will remain relevant in the future. If a task is programmable, it is more likely that AI will provide fruitful opportunities for making work more efficient. However, many tasks are not programmable, as even the goals might sometimes be unclear. Moreover, humans are needed to identify new problems and seek new questions to be asked from algorithms – indeed, AI is guided by human agency which means that specific humans' values drive AI development as well (Kaufmann, 2019). Yet, it is often expert work that AI is seen to offer new tools for. AI might support managers in formulating new problems, by highlighting issues not easily or quickly enough visible to the human eye.

One could hardly depict eye surgery as non-expert work. This means that even an expert's work process can be divided into small sub-processes that a purposeful division of labor between the human and the machine can be made. For instance, the eye surgeon can be the one to welcome the patient to her or his clinic, decide which tests are needed and decide to offer laser eye surgery. However, it is better that the automatic machine performs the laser surgery, since the reaction time of a human might not allow the surgeon to stop cutting if the patient blinks. An automatic system cuts so quickly that the blink of an eye is just something slowly happening around the automatic system. On the other hand, machines will not be able to assume responsibility over the results, especially if things turn worse. It is likely that a machine that automatically performs something undesirable will be reprogrammed or demolished, but the true culprit is the human who wrote the algorithm or the one that decided to use automation in performing the task. Naturally the opposite is possible as well – a hugely successful algorithm that sustainably provides wealth and wellbeing for its possessors is not likely to be rewarded. Rather, the possessor will reap the benefits. Indeed, the risk and reward are for humans to assume.

A key issue, altogether, is what AI means *in context*. How do business managers understand AI as a technology that provides new opportunities? Which kinds of threats do business managers see before AI? We go into these issues in the next chapter.

## 3. ARTIFICIAL INTELLIGENCE IN AUTOMATING AND AUGMENTING MANAGERIAL WORK – BALANCING HUMANS AND TECHNOLOGIES WITH A PURPOSE

### 3.1 Conceptualizing AI

One of the dominating themes of the NewBI5 project was the introduction of management accounting digitalization, i.e., AI to automating parts of accounting profession and even decision-making. However, there remains much ambiguity regarding what AI is and should be. AI can easily become a ‘black box’ that we do not thoroughly understand (Bolander, 2019), which is why we need to be careful that it does not drive us to just make worse decisions faster (Quattrone, 2016; Gärtner and Hiebl, 2018; Moll and Yigitbasioglu, 2019). We also need to decide upon what are the things we can and want to automate, what we might prefer augmenting, and what should remain for humans (Leyer and Schneider, 2021).

Furthermore, there are still many things we do not thoroughly understand about how management accounting can support managerial work such as decision-making (e.g., Hall, 2010). The quality of accounting information is not the only thing hindering our ability to make decisions (Saukkonen et al., 2018). On the contrary, sometimes the incompleteness of the information provided by accounting systems is not necessarily a purely negative thing (Jordan & Messner, 2012), but instead, can promote important debate among practitioners about the purpose of managerial work (e.g., Hall, 2010) and issues that would have otherwise remained invisible (Busco & Quattrone, 2018). The implementation of AI should, thus, be done with a good understanding about the context and the purpose for either automating or augmenting parts of decision support.

In the NewBI5 project, each company case concerned advanced analytics such as AI to a varying degree. The project work proceeded to investigate current challenges of those companies and their business contexts, resulting in various perspectives around opportunities of AI and its implementation. While the project companies were not AI-companies as such, the project work focused on tasks that directly involved analysing of massive amounts of complex data that would be work-intensive without advanced tools. Also, we did not investigate off-the-shelf AI solutions but instead focused on what kind of solutions and even specific algorithms could answer the challenges of each context. Overall, throughout our case projects, we identified four important questions about AI that we pursued in the project:

1. What kind of expectations are there for AI and how is AI talked about?
2. Are there sufficient antecedents for implementing AI?
3. What is the purpose of implementing AI?
4. What are we actually automating or augmenting with AI?

### 3.2 Exploring the expectations for AI and the discourses that follow

Artificial intelligence is talked about rather ambiguously with some eagerly waiting to capture its full computation potential replacing many of the jobs we currently have, and some others encouraging caution and critical expectations towards this yet another ‘buzzword’. However, we do need to acknowledge that the expectations we have for AI and the way we talk about it can influence what we end up doing with AI. In worst cases, we might end up automating something that should not have been automated, or vice versa, missing out on great opportunities to enhance our productivity. In her master’s thesis, Mirva Rantanen-Flores (2020) identified three distinct discourses of how business practitioners talk about AI. These discourses were *tool discourse*, *balancing discourse*, and *responsibility and power discourse*.



On the one hand, the tool discourse sees AI in a positive way, trying to innovate various ways how AI could help us in our daily tasks. The responsibility and power discourse, on the other hand, reminds us of the importance of human judgement, and how AI can only support humans as a servant. In one of the case projects, an AI solution was used to give healthcare professionals recommendations about technology implementation, but at first, it sprang cautiousness and even resistance amongst the employees. However, this cautiousness faded after the solution had made some successful recommendations.

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*“Artificial intelligence is talked about rather ambiguously with some eagerly waiting to capture its full computation potential replacing many of the jobs we currently have, and some others encouraging caution and critical expectations towards this yet another ‘buzzword’.”*

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Finally, the balancing discourse especially looks at the human-machine interface, trying to find a balance where the humans and machines could cooperate as co-workers, aiming to gain the benefits of AI without losing the important parts of managerial work. These three discourses each drive our focus towards certain issues about AI implementations, which is why we encourage a balance of various discourses that enables rich debate from multiple perspectives (Rantanen-Flores, 2020).

### **3.3 Ensuring that there are sufficient capabilities for implementing AI**

In addition to the expectations managers have and the ways they talk about AI, the companies might have other limitations that hinder the diffusion of AI solutions. One of those things is the data available for AI to use. In his thesis, Oskari Lager (2021) investigated the process from discovering dark data to using it purposefully. Dark data is data that an organization has but which either is not known or is not yet being used by the organization (Gimpel, 2020). In some cases, organizations might have put a lot of effort and money to gather data that currently ends up just being stored in their data warehouses. Moreover, since the data does not yet have any use cases, there is a possibility that the quality and nature of data does not support potential analytics sufficiently, for example, if a required feature is not yet being gathered or if linkages between data sources are not being made. Indeed, another challenge with this type of data is that it can be difficult to link it with other sources of data in a useful way. Whether AI can help organizations use dark data, or whether dark data will compromise the quality of answers provided by AI remain to be seen. However, it is important to know what the quality of the data given to AI is, since AI might not be able to make that assessment.

Additionally, in one of the cases the piloted AI solution utilized data with open field healthcare service descriptions for the recommendations it gave to the employees. However, the descriptions in these documentations were not always made robust. Thus, the AI analysis could not always identify key factors behind the recommendations correctly. For example, since the algorithm was aimed to identify specific healthcare tasks, it could only work with the data documented and could not identify irregular tasks that were not always documented. Moreover, it did not know what certain tasks meant from the perspective of planning the healthcare services. Also, factors such as opinions, personality, mood, etc., could not be clearly documented and still required judgement from the healthcare professionals. While these factors compromised the quality of recommendations made by the AI, it was still able to reduce a lot of manual work involved in making those recommendations manually.



### 3.4 Using AI purposefully

Another important perspective that was highlighted in NewBI5 was that there should be a clear purpose for adopting AI in a task or a process. It is easy to approach AI by investigating what can be done with it, but sometimes these tasks could be performed with much cheaper and simpler methods. In our cases, we noticed that the potential of AI became even clearer when its use was investigated in tasks that would be otherwise by unreasonably work-intensive or even difficult to accomplish with simpler analytics.

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*“there should be a clear purpose for adopting AI in a task or a process”*

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In one of the healthcare cases, for example, the AI was first used to identify recurring client visits with specific tasks. While this was indeed beneficial and could help identify unnecessary visits, we also found out that the time of the visits is crucial for the benefits acquire from rearranging care by reducing or rescheduling visits with the technology. Therefore, the questions that are being asked from AI are critical for AI to be able to support tasks with a specific purpose. Later, the AI focused especially on visits during mornings when the healthcare professionals were most occupied. For example, tasks like showering could just as well be conducted in the midday, when the demand for care is lower, expanding the capabilities and use of AI to give recommendations that have a more significant impact on organizing care.

Advanced algorithms can also be utilized for exploration of data. The algorithms allow firms to see if they could find connections between their clients' data that have been accumulated in their systems during service provision. For example, a firm could predict an undesirable or desirable outcome based on certain points of data, and thereby provide their clients with hugely important future scenarios. Such undesirable outcomes could be high employee turnover or numerous sick leaves. Vice versa, a desirable outcome could be high employee satisfaction. During the project it became clear, however, that analytics require customization for different clients, since data appear to be different, motivations for utilizing data are many and thus require a consultative approach to developing meaningful analytics that suit the specific purposes. Indeed, customers can acquire valuable knowledge from analytics once the algorithms suit their specific purposes and problem formulations. Some of these findings are documented more in detail in the thesis of Lauri Suomela (2021).

### 3.5 Defining what to automate, what to augment and what to leave for humans

As AI algorithms are developing, we get new tools that are capable of many very interesting things. However, they are not always the only solutions to the problems that we are trying to tackle, and more importantly, we need to carefully consider the extent of the tasks and processes we delegate for AI. For example, in NewBI5, the machine learning algorithm that we piloted on natural language processing was able to identify and categorize written descriptions similarly as the business experts of an organization. This way, the algorithm could find similarities between open field descriptions which means it could be possible to handle a larger number of cases more systematically when using AI. However, the quality of descriptions did still vary, and without a more systematic data generation method, the machine learning algorithm would not be robust enough for real use. Moreover, the same effect could be achieved with simple drop-down options that they were already designing for the updated version of the system. Thus, while the AI was somewhat capable of the task, it was easier to alter the data gathering method to get more robust information that was not so prone for issues such as grammatical errors or translation problems.

In one of the NewBI5 cases in healthcare, the piloted AI was designed to give recommendations, but the final decision was left for the healthcare professionals. There were several reasons for this. First, they have a lot of tacit information about the care processes of the clients that are not stored as part of any database, making the automated decision-making impossible, even if the algorithms would be capable of handling such information. Second, even if they had sufficient timely data about the clients' opinions, personality and so on, such AI solution would not necessarily be trusted and it might face change resistance. Third, healthcare professionals are experts

on providing care, but they lack the time to manage such time-consuming data analysis, which is why empowering them with the decisions, while supporting it with advanced algorithms gives them more control over their own work but time efficiently. Thus, the (1) quality, nature, and quantity of data, (2) responsibility, and accountability of AI, as well as (3) the enabling role of empowering support instead of impairing control for the work of healthcare professionals, were driving factors on how the AI was then implemented. As such, AI helped augment their decision-making by going through the large sets of data and providing recommendations that would otherwise have to be identified manually.

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*“AI helped augment their decision-making by going through the large sets of data and providing recommendations that would otherwise have to be identified manually.”*

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As a result of the AI pilot, the AI algorithm was able to make 4 recommendations that were followed up upon by care professionals. However, the organization had already made significant changes in arranging care, so it was rather hard for the algorithm to identify new recommendations at the time of the pilots. The pilot only had three care units, and sometimes it was not clear whether the AI had been the source of care rearrangement or not. Moreover, the interface for healthcare professionals had to be such that they would consider it worth taking their time to use it. In the pilot project, the users logged into a dashboard, which highlighted the recommendations and ranked them based on their likelihoods. After going through the top recommendations, the healthcare professionals discussed them together to consider if there is something that the AI was not able to take into consideration. The dashboard had not always been used weekly or even monthly as requested by pilot management team, indicating that the interface might not be easy enough and/or that the good recommendations were not that common enough to inspire more frequent use. When asked, if the care professionals would recommend such tool, some said that they would recommend the tool for organizations that do not yet have that much experience, but at some point, they became faster at identifying new possibilities to rearrange care, so their care was redesigned before they even had the chance to be recommended by the AI. Thus, it seems that even a capable AI solution can sometimes only temporarily help in the process it was designed to. However, this temporary period is critical for the diffusion of the technology in new customer healthcare organizations, and because of this, such solution can be worth the effort.

### 3.6 Lessons learned

To summarize our findings, we highlight four key insights:

1. **The expectations for using AI, and the resulting discourses we have, are not insignificant but can instead steer the way we think about using AI and how we end up using its applications.** We might have too pessimistic or optimistic expectations for AI, which can result in unsuccessful AI implementations. In addition, we are seldomly able to make decisions only based on accounting answers provided by our analytics, but instead, the decision-making processes and accounting support are much more complex than that. For example, sometimes the incompleteness of accounting information can help us ask the right questions and understand things previously invisible better than before. By seeking to utilize AI for sparking discussions rather than pursuing definite answers, management accountants could start utilizing AI not to bring closure but open new debates by harnessing the power and speed embedded in algorithms.
2. **We need to provide AI data of sufficient quality to work on.** AI can only be as intelligent as the data it is given to learn from. We need to make sure that the data we use to teach AI represents the real-world phenomena to a sufficient extent – to make it possible that analytics can provide us with answers that are useful.
3. **AI should not be implemented just for the sake of having AI.** There is a real risk that we lose an important part of managerial work when we adopt AI. AI can do much with the historical data even by forecasting possible future scenarios, but it lacks the innovative and

visionary capabilities that are characteristic of humans. Thus, while AI is expected to be able to do many of the tasks we currently perform in our daily work, it might not be the only solution or the best solution, or even a viable solutions for many problems. Before we know we can trust something with AI, it is worth considering is AI the right, the cheapest, and the best approach to solve an issue at hand.

- 4. We should carefully consider what the extent that we are automating or augmenting decisions and decision support is.** Sometimes we might be able to automate simple recurring tasks quite easily. Sometimes, we might be able to augment tasks, by utilizing the computation power of AI, but AI as a co-worker and not one in the lead. Sometimes, we might need someone to act as a filter between decision-makers and AI, ensuring that AI is harnessed in a right way. There can be much learning in the process of analysing something to get the answer to a question, which sometimes can even be more important than the answer itself (e.g., budgeting). With AI, this all can be lost unless we adopt a process of interrogation not only to get what the AI answers, but also to understand why the answer is what it is.

## 4. USING ANALYTICS FOR UNDERSTANDING AND MANAGING CUSTOMER VALUE TO ENABLE INTERNATIONAL GROWTH

### 4.1 Background

A common denominator among NewBI5's innovative company networks was interest in understanding and enhancing the services provided to customers. All company cases, in different ways, focused on customer-value creation, whether it was measuring and managing the impact of existing products and services or creating new business around improved customer analytics. While it could be just coincidence that the topics were similar, there is also increased general interest in moving from product-orientation towards customer-orientation. Moreover, AI and big data also improve the ability to explore such information about customers that was previously either unattainable or required too much effort. Indeed, there are several interesting avenues for using AI to analyze things about customers that were not previously possible. While advanced analytics have started to have a role in marketing (e.g., Ngai et al., 2009; Stormi et al., 2018), B2B companies are commonly still facing challenges regarding gathering and analysing data (Cortez & Johnston, 2017). These attempts are not only important for managing current customer relationships but also for pursuing new growth possibilities both nationally and internationally.

The expansion of management accounting practices and advanced analytics towards customers and the value perceived by customers is part of downstream interorganizational management accounting (Caglio & Ditillo, 2008). While interorganizational management accounting research has a relatively rich history, a literature review by Caglio and Ditillo (2008) found that the research has been rather one-sided, focusing mainly on how customers use management accounting and control with their suppliers using tools such as open-book accounting (e.g. Suomala et al., 2010; Mouritsen et al., 2001; Caglio & Ditillo, 2012), value chain analysis (e.g. Dekker, 2003), make-or-buy scenarios (e.g. Cooper & Slagmulder, 2004) and target costing (e.g. Mouritsen et al., 2001). A number of studies investigate this upstream customer-to-supplier(s) management accounting and cost management, with only limited efforts to approach the downstream perspective (e.g., Wouters & Kirchberger, 2015) as well as horizontal competitor and complementor perspectives (Caglio & Ditillo, 2008). More specifically, the management accounting literature had not really taken on the challenge of translating customer value to the monetary dimension until Wouters & Kirchberger (2015) claimed customer value propositions as a form of interorganizational management accounting. NewBI5 took steps forward in exploring and elaborating on the process of understanding the mechanisms of customer value creation as well as assessing customer value with management accounting techniques following the preliminary work done by Wouters and Kirchberger (2015).

One of the ways we used to understand the value creation and its mechanisms was combining service logic (SL) and pragmatic constructivism (PC). A combination of SL and PC can help managers understand how value is created and by who, when technologies disrupt existing processes. With the help of SL, we can identify a network of actors who have a role in the creation, facilitation, and co-creation of value (Grönroos, 2011; Grönroos & Voima, 2013) to understand how value emerges and evolves through individual action. The use of PC allows us to illustrate the facts, possibilities, values, and communication (Jakobsen et al., 2011; Nørreklit, 2017; Nørreklit et al., 2006; Nørreklit et al., 2010) that lay the foundation for intentional adoption of technology and value stemming from using it (Tiitola et al., Forthcoming).

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*“NewBI5 took steps forward in exploring and elaborating on the process of understanding the mechanisms of customer value creation as well as assessing customer value with management accounting techniques”*

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## 4.2 Pursuing the mechanisms of value creation for making more robust value propositions

We approached the pursue of customer value mechanism with a process similar to value assessment by Keränen and Jalkala (2013; 2014). To enable the diffusion of their technologies, companies wish to be able to better communicate the financial implications of their solutions, which is what the master's thesis by Maria Marek (2020) examined. In the thesis, she started to model the mechanisms of value creation and the financial implications of the value created by developing a customizable tool that can be adjusted with the information customers and their stakeholders (e.g., the customer's customers). However, planned value creation actions would require active redesign also regarding the customer's (and their customers') processes. There can also be a lot variance between countries and regions, which is why local characteristics easily require attention when building a customer value calculation model (Marek, 2020). More information about how the customer value propositions can be customized for different customers can be found in the thesis (Marek, 2020).

Similarly, in one of the healthcare case, we identified several different value elements that the technology can enable. It can both improve the quality of healthcare (a more intangible benefit) while maintaining, rearranging or even reducing the current care workload (a more tangible and even measurable impact). However, through impact analyses performed with the customer healthcare organizations, we identified that not all value elements are achieved to same degree, suggesting that the perceived value (especially in monetary terms) was higher with some customers (and even end clients) than with others. As such, the technology implementation seemed critical for achieving the expected value, as it should be possible to redesign care with the help of the technology. Moreover, not only is the implementation an important factor in the total customer perceived value achieved, but also the care must be actively managed, and the decision made to redesign the care (sometimes technology was just implemented on top of existing processes, without taking steps to redesign care as planned). Even further, there are also points in time where the impact achieved with the technology might no longer be possible so to maintain the impact and the resulting customer value, the care organisations need to also consider when it is time to take away and reallocate technology to keep maintaining the achieved customer value. These mechanisms again highlight the nature of customer value and how customer value is far from just being something embedded in the technology itself, but instead requires active management to manifest.

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*“customer value is far from just being something embedded in the technology itself, but instead requires active management to manifest”*

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## 4.3 Managing value creation to improve current relationships to open future growth possibilities

In one of NewBI5's companies, AI was employed to understand how personnel well-being (at the customer) might connect to other variables, such as personnel satisfaction and absence from work. This company was interested in finding out how AI algorithms could support their client companies in understanding the drivers of work well-being. AI algorithms were harnessed to seek connections between data points: could some points of customer data explain or predict absence from work, for instance? The piloting was conducted at current clients, which made sense: the company already had established a trusting relationship with the client and there was already data about the specific client in the company's systems. It was noticed that those algorithmically identified issues that would matter to the customer were already known. In this sense, AI could not necessarily provide new or ground-breaking insights but reassure the existence of certain believed-to-be connections. It was also noticed that customer companies' data and interests about this data would vary. Hence, a system that was scalable with few modifications based on customers' characteristics would be unlikely. A more consultative approach to analytics was found more purposeful. With such analytics consulting, the company could help their customers understand some important aspects about themselves (based on data) and generate also potential

sales growth. The analytics development project is described in detail in Lauri Suomela's (2021) thesis.

In another project within healthcare, through experience gained in implementing the technology and analysing its impacts, the technology provider realized that they need to have more active role in managing the technology. It was not enough to act as the provider of the technology, but they had to also move towards helping their customers achieve the value potential of the technology. This included providing recommendations (the AI pilot) and managing the implementations (a spreadsheet tool with estimated expected technology impact) as well as to the impact analyses after the implementation and use (business intelligence reports with operative impact estimates based on customer data). This way they could ensure and show their customers that they are able to achieve the impact they desire and also communicate that impact further to the parties involved for financing the technology.

While some of the work in NewBI5 did not directly focus on assessing or understanding the mechanisms of value creation as such, the analytics in those cases focused on information that could enable concrete possibilities with customers. However, it was not always obvious that certain analyses or information could be useful especially in a way that could enable new sources of value for customers or new sales. Data enabled many possibilities both by using advanced analyses such as natural language analysis (Juutilainen, 2019) or investigating data previously unknown to some people in the organization (Lager, 2021). However, it became clear quite quickly that it is not worth putting much effort to creating analytics that does not directly serve a purpose that could help either a firm or its customers. Thus, throughout NewBI5 it became clear that the starting point should not only be data mining in the sense that a company has data and starts to think where to use it, but the company should also think about the use cases that actually serve a purpose in the organization (Lager, 2021).

## 4.4 Lessons learned

Overall, our main insights are:

1. **New analytics and sources of data can enable new types of customer-oriented inter-organizational management accounting approaches.** As we can gather new types of data from our customers, we can also move towards more customer value-oriented accounting approaches. For example, we have new opportunities to use this type of information to ensure that we are enabling the customer value we propose and promise. This way we can not only show at least parts of the impact our services and products have for our customers, but also identify new sources of products and services that could help our customers. Moreover, we are also no longer limited to gathering the data ourselves, but as the value of data increases and becomes an asset worth trading, new data providers start appearing and we can also acquire such data from other parties.
2. **The actions of customers have a significant role in the creation of customer value.** The idea of creating customer value for customers has enabled suppliers to consider what customers value in their products and services. However, the concept of customer value being something embedded in services and products starts to diminish if we stop to consider how the impact of our products and services really emerges. It is quite common that customers have to change their actions for the customer value to emerge, which is why theoretical lenses such as service logic (e.g., Grönroos & Voima, 2013) are moving towards considering customer as the creator of value. This does not mean that suppliers cannot influence value creation, quite the contrary. By considering how suppliers can help customers create value, we can come up with new ways for value co-creation together with the customers and also ensure that we are able to facilitate the change required for customers to create the value they expect.
3. **Customer value creation can benefit or might even require active management.** In the simplest terms, a product that gets lost in an inventory cannot enable the customer create value, but instead, only creates costs for the customer. There can easily exist barriers that prohibit customers from using our products and services to the extent suppliers might think possible. By putting effort to investigating if customers are using the products as intended, or sometimes even better than we intended, suppliers can identify the steps required to help their customers create value.

## 5. DECISION-MAKING AS A PART OF MANAGERIAL WORK

### 5.1 Decision-making and decision-support tools

Since the 1980s, different roles of accounting in decision-making have been identified and examined (e.g., Burchell *et al.*, 1980). While earlier research in accounting has noticed distinct supportive roles for accounting in organizational life (Burchell *et al.*, 1980; Wouters and Verdaasdonk, 2002), its roles are far from thoroughly understood (Hall, 2010; Wouters & Roijmans, 2011; Mouritsen and Kreiner, 2016; Busco and Quattrone, 2018; Saukkonen *et al.*, 2018). Overall, accounting aims to support varying purposes by providing information that could be used in decision-making to understand the business impacts and consequences of a given decision. Performance measurement systems as well as accounting information systems are there to provide such information (Burchell *et al.*, 1980; Wouters & Roijmans, 2011), but relevant financial information can be provided outside the management accounting and control function. Business impact information can be obtained from accounting information systems (see e.g., Granlund, 2011; Ruggeri and Rizza, 2017). However, there are technologies that have the potential to combine and translate information also from outside these systems into information with financial significance, and for decision support respectively (see, e.g., Nielsen, 2018; Oesterreich and Teuteberg, 2019). Despite the availability of increased accounting information and more advanced analyses, these systems do not always support decision-making (Hall, 2010; Quattrone, 2016).

Decisions can be considered to take place as processes (Mouritsen and Kreiner, 2016) where decision-support from accounting information is connected to information provision and analysis activity (i.e., management accounting practices), forming the process of decision-support (Wouters & Roijmans, 2011). However, information provision and analysis might still require judgement, in order to make sense of and overcome uncertainties in decision-making (Burchell *et al.*, 1980; Quattrone, 2016). Non-routine decisions then take place as an iterative loop of information provision, analysis and use – information provision and analysis feedforward to information use and feedback to information provision and analysis. As such, the supportive role of management accounting can resemble a sort of interrogation, where the iterative use of questioning and answering can promote debate among decision-makers and those providing support to decisions (c.f. Maieutic machines by Busco & Quattrone, 2018). Both decision-support and decision-making can be done by individual managers or between individuals, teams, functions or even organizations. Finally, the act of decision-making helps managers reach some objectives and incur desired business impacts, that are often uncertain; though management accounting, in a sense, is there to enable a promise of those business impacts (Mouritsen and Kreiner, 2016).

Finally, it is worth mentioning that managers and teams not only utilize the formal, centralized accounting systems, but often also create their own individual accounting systems and non-formal sets of information that support the individual needs for their own managerial work. Vernacular accountings are informal, decentralized, employee-generated accounting systems that have an important position in supporting managerial work alongside formal systems (Kilfoyle *et al.*, 2013). They emerge and evolve as a natural approach to manage tasks at an employee-level for example, when new technologies are introduced to dynamic environments. Kilfoyle *et al.* (2013) suggested that these informal accountings might emerge when managers face complexity or uncertainty that promotes exploration. In such cases, the organization might not have formal systems to handle emerging issues, which might require that managers independently search and manage information through their own informal accounting systems. These accountings are easily left unacknowledged even though they can have a significant impact on the actions of individuals making managerial decisions (Hall, 2010). However, we might get glimpses of these systems if we trace the incidents and switching paths that make up the decision-making processes.



## 5.2 Critical Incident Techniques to understand decision making

Decision making happens when individuals choose among alternatives with the objective of finding the best alternative; decision making can be studied as a process or as an activity (Cook et al., 2012, p. 3). In real-world settings, decisions are subject to four key features: dynamic and continually changing conditions, real-time reactions to changes, ill-defined goals and ill-structured tasks, and knowledgeable people (Klein et al., 1993, p. viii). Early research focused on mathematical models that analyzed decision making from an economics and game theory perspective with laboratory experiments (von Neumann & Morgenstern, cited in Klein et al., 1993, p. vii). However, artificial settings do not represent real-world settings of decision making, for which a series of realistic decision-making models have been introduced such as critical incident techniques.

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*“Decision making happens when individuals choose among alternatives with the objective of finding the best alternative”*

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Critical incident techniques derive from Flanagan’s first proposed Critical Incident Technique (CIT). According to Flanagan (1954), an ‘incident’ is a noticeable human activity that is sufficiently complete to allow predictions to be made about the person that will perform the act. A critical incident is one in which consequences involved are sufficiently evident regarding its effects and the objective of the act is widely evident for the observer (Flanagan, 1954). Throughout the years, various methods have been created to analyze and describe the criticality of incidents. The Critical-Incident Technique (CIT), presented by Flanagan (1954), entails of a set of procedures to collect direct observations of human behavior and identify broad psychological principles. Originally, the CIT was utilized by the US Army Air Forces to select and classify aircrews (Butterfield et al., 2004). Researchers utilize this technique to find the most frequent quality determinants through a traditional content analysis (Roos, 2002). Moreover, Stauss and Weinlich (1997) introduced the expanded version of the critical-incident technique, the Sequential Incident Technique. This technique contemplates that customers can relate to specific customer processes; therefore, normal service encounters are to be included with critical service encounters. Variations of the critical-incident technique acknowledge the disparities and dynamic nature of critical incidents. In the same line, the Switching Path Analysis Technique (SPAT) is based on a consequence of a critical incident as described by the customer (Roos, 2002), and is thus suitable for studying customer behavior, relevant to NewBI5. In SPAT, an incident has a trigger, an initial stage, a process, and a consequence (Roos, 2002). Triggers are catalysts that make the decision maker inclined to act, they fuel and steer the process (Roos, 2002).

The CIT and its variations were originally focused on differentiating effective and ineffective work behaviors in executing a task (Coetzer et al., 2012) and critical incidents under study were typically negative incidents. However, researchers have applied CITs to study diverse experiences and have interpreted incidents under several other settings, including customer relationships and service encounters (e.g., SPAT by Roos, 1999), business relationships (Selos et al., 2013), learning processes (Cope & Watts, 2000), and decision-making (Coetzer et al., 2012). Furthermore, data collection in CITs has evolved. While Flanagan focused on trained experts collecting direct observations of human behavior, most CIT studies have gathered information through retrospective self-reports.

One example of using CITs (and SPAT more specifically) in decision-making was a case that sought to identify the reasons why a raw material manufacturer made an investment in a continuous monitoring and cleaning system for its production facilities. From our experience with similar organizations, it appeared that the investment was made to prepare the organization from future environmental regulations. However, when analyzing the case, we identified that the decision was made for three different reasons: to prepare for environmental regulations, to solve potential health issues from emission exposure, and as part of the organization’s efforts to make their processes transparent. Utilizing CITs allowed us to identify how the organization’s own resources (the R&D department) acted as a pushing determinant, as the new system was to be developed in-house, which meant a lower investment and opportunities to cater the system to the organization’s specific needs.

Employing CITs to study decision-making processes has various advantages. First, CITs are flexible and versatile tools that can be adapted to meet the requirements of diverse study settings.



Second, data can be gathered through various methods, including face-to-face interviews, group interviews, questionnaires, among others. Third, as CITs rely on retrospective self-reports; information is gathered through respondents' accounts of events that happened, instead of broad generalizations or outsider opinions. Downsides of CITs include the dependence on the accuracy of memories of participants (Sharoff, 2008) and the difficulty to separate the story of one incident where there are multiple stories within it (Coetzer et al., 2012).

### 5.3 Application of Critical Incident Techniques in NewBI5

In our case studies, a decision was studied as the 'incident' and in some cases we were able to shed light to what happened before, during and after a decision. Decisions under study were related to investments or other rather major business choices. Thus, in line with the SPAT logic, it was possible to shed light on what triggers the *actual* decision-making process, as well as what events (identified as determinants) happened after that trigger, which lead to the decision. By having different accounts of the same decision, we were able to identify dynamics, common triggers and determinants that lead to the decision. Furthermore, by studying the events that lead to the decision we were also able to identify the role of different stakeholders in the process. Thus, our studies successfully applied variations of CIT, to study decision making in business-to-business (B2B) settings as well as in business-to-government (B2G) settings. While both B2B and B2G sectors are subject to decision-making complexity, these sectors vary greatly from each other as private sector organizations seek to maximize wealth for shareholders while public service organizations seek to satisfy the community's needs (Nutt, 2006). For both sectors, the SPAT provided in-depth understanding of the context and offered a clear view to the path leading to a decision.

For technology providers, the CIT offers various possibilities. If a company understands when, by whom and why their potential customers decide to invest in their products or services, they are more able to target their marketing and sales activities in a purposeful manner. A message that is directed to correct people at a correct moment, and with correct arguments, will offer promising new business opportunities for Finnish goods and services, also internationally.

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*“A message that is directed to correct people at a correct moment, and with correct arguments, will offer promising new business opportunities for Finnish goods and services, also internationally”*

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### 5.4 Lessons learned

1. **Consider how even non-routine decisions can be supported by accounting and elaborate analytics:** As many large decision processes are one-off tasks, there is variance about how structured such processes are. Sometimes there are multiple tools available for decision support, whereas occasionally decisions are made based mostly on human intuition or judgement. There are no one-size-fits-all AI applications for non-routine decisions, but clever utilization of both formal and informal analytics might provide useful inspiration, e.g., by helping understand the operational environment that surrounds the decision.
2. **Acknowledge the path-dependency of AI-related decisions:** Decisions in complex business networks take place in a path-dependent manner. Hence, a past decision often influences the future decisions as well. The same is true for AI implementations. A careful implementation of AI as a decision-support technology allows flexibility where needed and avoids technological lock-in.
3. **Be curious about decision outcomes to learn:** Try to understand why a customer either decided to use your product or service, postponed the investment, or selected a competitor's solution instead. This way your organization can learn for possible future deals.
4. **Focus on critical incidents on the path to a decision:** Critical incident techniques help reveal dynamics behind decision-making by gathering information through respondents' accounts of events that happened. By analyzing the critical incidents on that path might help understand the key decision determinants. Sometimes researchers can provide much needed resources for analyzing specific investment decisions.

## 6. ENABLING CONTROL – SUPPORTING THE ACTORS INVOLVED

### 6.1 Responding to the managerial challenges with enabling control

This chapter responds to the challenge of successfully managing so that performance and employees' well-being are being supported and balanced. As used during the project, the chapter employs the concept of enabling control, which conveys the idea that management controls can support employees' work rather than restrict it. Adler and Borys (1996) discussed two types of bureaucracies, that are enabling and coercive, and concluded that there are four important characteristics that lead to enabling type of support to the employees: global transparency, internal transparency, flexibility and repair. The characteristics, presented by Adler and Borys (1996) have been transferred to the management control literature, with some modifications, refinements and interpretations of those characteristics (Ahrens & Chapman 2004; Jordan & Messner 2012; Laine et al. 2020). In this chapter, we interpret the characteristics as follows:

First, *global transparency* means that the employee knows the characteristics of the business context. Then, building on this understanding, one can understand and anticipate major trends and the organization's potential role in them? Second, *internal transparency* means that the employee knows, how everything functions in the organization. Sometimes, it is the best insurance for the employee to know what the impact of one's work is, and actively work based on, discuss and share this understanding with others. Third, *flexibility* means that the employee can sometimes act outside the rules and routines. Perhaps, the employees are sometimes encouraged to think beyond the current procedures to attain the best possible result. Finally, fourth, *repair* means that the formalization encourages taking initiative and solve problems. To simplify, by following the example of Adler and Borys (1996), if the paper is stuck in the printer, it might not better to just leave it alone but react in one way or another that helps surmount this small problem.

The characteristics of enabling control are rather versatile and raise several questions. Essentially, it is about the perceptions of one employee and all the employees. Whether employees experience being supported or obligated by managers (who influence the employees in different ways) in their work determines whether control is enabling or coercive (Jordan & Messner 2012; O'Grady 2019). Indeed, the term control is not a synonym to surveillance. On the contrary, control consists of various managerial ways of aligning employees' interests with those of the organization, to motivate them to contribute to attainment of organizational objectives without coercion (Merchant & Van der Stede 2007; Linneberg et al. 2020). The holistic framework of control includes administration of employees (e.g., the organizational structure and policies), long/short-term planning of business, budgeting of operations, personal incentive schemes and even the organizational culture with shared values, identities and symbols of success (Malmi & Brown 2008). A formalization is a certain type of control: it is the "written rules, procedures, and instructions" for a specific operation or task (Adler & Borys 1996, p. 62). In an organization, this definition of formalization works as a part of the holistic framework of control.

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*“control consists of various managerial ways of aligning employees' interests with those of the organization”*

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### 6.2 How to enable action in the NewBI5 contexts?

During the project, there were many examples of controls under development in the studied organizations. First, in one case, the idea was to develop a platform for unveiling, examining and

communicating the value elements of the technology. Therefore, one can see that the platform was supposed to increase internal transparency of the actors involved at the provider and the customers. Overall, as the platform collected extensive information about the technology features and, essentially, the customers' processes, it had also nice connections to the global transparency of the business logic.

The platform was developed in cooperation. In this process, several iterations took place, and the platform was developed in a flexible way and repaired when needed. Overall, it provided new ways to understand the value and business potentials, in such a way that it enabled new discussions via new channels among the actors involved, thus constituting the possibility for enabling control in anticipating and measuring the value creation.

Second, in another case, a somewhat similar development took place, as there were plenty of analyses conducted on the value generation stemming from the use of the technology. Due to the longitudinal cooperation between the researchers and the firm, the internal and global transparency of the value generation could be created and enhanced. Furthermore, especially in this project, there were plenty of vernacular accountings developed in order to understand the specific aspects of value generations. These vernacular accountings enabled the actors to make operational decisions on the matters at hand. At the same time, the development of them enabled broader repairs for managing the technology at the customers. Therefore, also this case seems to qualify as enabling control practice.

Third, there was overall plenty of opportunities to observe and examine the characteristics and peculiarities of the enabling control in the online work and remote settings, that were largely in use since the middle of the project. In practice, the online settings provide clear possibilities to critically examine each of the characteristics of the enabling control, thus reflecting the challenges faced by many organizations that needed to shift fast to new remote work:

- *Repair* may take place in the online settings individually and in isolation, if new processes and divisions of tasks have not been articulated. There is then a greater chance that repair efforts are taken case-by-case, which may cause sub-optimization and, remarkably, learning from each other is limited.
- *Flexibility* may naturally be increased in the online remote work and thus some people may take advantage of the situation. Positive flexibility would mean organizing of work and developing the practice independently on the time and space. Negative flexibility would mean reduced integrity and lack of self-discipline in carrying out the needed tasks, which results in lower or negative impacts.
- *Local transparency* may clearly be challenged, when the employees do not informally meet and discuss with each other. In the online settings, there seems to be more information sharing meetings, which, in turn, increase the overall burden of the calendars and thus restrict possibilities to rethink and learn. Furthermore, if informal meetings become fewer, one needs to find ways to discuss the wider potential of individuals and teams as a learning enabler.
- Regarding *global transparency*, online settings enable documentation and even recording of many new activities. This might help in local transparency building as well. However, despite the increased amount of digitalized data on the activities, the "big picture" may not be understood by anyone anymore, but fragmentation of the knowledge may increase.

Altogether, given the challenges presented above, the new ways of working need to be critically examined and decided. Indeed, there is a need to revisit and discuss organizational values and assess, if the organizational practice remains in line with them also in the new settings. Enabling control may be built in the new settings also, if the practice is built on the values, not necessarily continuously compared to previous practices. This mindset acted upon in the organizations constitutes the development and, desirably agile learning activities in the online settings also in the long-term.

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*“there is a need to revisit  
and discuss organiza-  
tional values”*

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### 6.3 Reflections on enabling control in forerunner organizations

The employment of the characteristics of the enabling formalizations do not result in short-term and long-term impacts in a straightforward manner. The desired benefits, such as good individual performance and employee well-being, become eventually realized though the actions made in practice. The practitioner and her actions become the essential link between enabling formalization and impact. Such a link has been identified and acted upon in forerunner technology organizations that NewBI5 researchers have been observing while collaborating with them (2018-2021). The lessons learned from those contexts provide useful information about the enabling formalizations more broadly.

It is noteworthy that in an enabling setting, like in those forerunner organizations, the created procedures and instructions leave space for the practitioner to act based on her values, judgements and interpretations of meaningful work. This helps sustain practitioners' motivation towards the work, which is a topical goal for organizations. Achieving a value-driven and functioning practice (Nørreklit, 2017) is becoming increasingly relevant, as employees long for purpose, meaning and value-alignment in their work. Flexible possibilities for remote work are rather natural choices for organizations that in general leave space to act for their employees. In all, there are organizations that have been flexible in their remote work arrangements already for several years, while investing in employee well-being at the same time.

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*“leave space for the practitioner to act based on her values, judgements and interpretations of meaningful work”*

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Indeed, examining the forerunners allow us to identify functioning practices which can be further developed and transferred to other organizations. Altogether, the identified forerunner practices can support employee's in realizing personal values in everyday work. We have made the following observations:

- Control systems in the forerunner organizations are based on the assumption that people's knowledge and capabilities are recognized, realized, developed and thus they add value to all the parties involved.
- Organizations promote employee judgement over formal guidelines. They give responsibility and autonomy to people, employees are encouraged to make decisions, even investments for better results. Trust leads into commitment.
- Empowerment helps using one's full potential. Once the wider potential can be used, performance and profitability will follow.
- Organizations emphasize a comprehensive view on meaningful life and well-being, rather than acknowledging only career achievements.
- Organizations emphasize project outcomes rather than project budgets, encouraging to keep promises to the client.

As concluded during the project, by Korhonen et al. (2020), some organizations have questioned the necessity of having bureaucracy and hierarchies as a basis for managing and controlling employees. The background for the “freedom-responsibility nexus” lies far in the history, in the thoughts of Aristotle and Plato, for instance, on free will (Dierksmeier, 2011). In today's world, how people organize themselves represents the current worldview – similarly as the different ways of organizing have represented the worldviews of earlier decades, centuries and millennia (Laloux, 2014, p. 15). Furthermore, the project work contributed to the literature of language and social interaction, by raising some important questions that require further inquiry. Importantly, we expect the perspective of language and social interaction to provide a high-resolution tool for understanding self-managing organizations. Examination of language and social interaction is needed for analyzing how people act in their various encounters at work, where the actual tasks of the organization are talked into being, to show, e.g., how emergent leadership takes place in less hierarchical organizations (Lee & Edmondson, 2017; Salovaara & Bathurst, 2018; Gerpott et al., 2019).

In sum, enabling good work performance in remote work requires courage to allow and support activities beyond the current indicators and strict rules. Trusting employee judgement on relevant actions may not fit to the mechanistic view on controls and formalizations. However, it can pay back in the forms of employee commitment and sense of meaningful work. For management, relaxing and loosening the formal controls may require stepping out from the comfort zone to make the difference. In other words, adding mechanistic monitoring in the new remote settings moves practitioner's attention from the work itself to reacting on the increased monitoring requirements. While keeping up the sense of control, organizations simultaneously challenge their employees' possibilities to align their personal values and reasoning to everyday work.

Of course, organizations and individuals within are not homogenous. Organizations have had different starting points in complexity, stability, and routinization when entering the remote settings. Therefore, the constituents of the enabling control in the online settings deserve further attention and examination, also with the access to the day-to-day practice. Essentially, learning from the forerunner organizations does not mean merely copying organizational level principles and "enabling control" accordingly. Instead, the principles need to be adapted to different contexts.

## 6.4 Lessons learned

Altogether, the findings of the project support the idea of enabling control as one of the key success factors in the modern organizations. Essentially, in the NewBI5 project context, enabling control requires both the presence of advanced business analyses and the enactments of leadership in an enabling manner. As a result, success and performance will be based on understanding, courage and empowerment and different levels, among different actors, who thus think and act accordingly.

This chapter, and the project more broadly) suggests the following principles to be enacted in the enabling control, in order to enable functioning practice and performance both at the individual and the organizational levels:

- Make sure that everyone understands and is able to observe the rationale of performance in the organization.
- Make sure that everyone is supported and dares to be oneself and use one's capabilities and potential at work.
- Make sure that there are avenues and mechanisms to think and act beyond the current boundaries and performance indicators.

These propositions are not the ultimate end, but more readily they can serve as a basis for further development. The project suggest that success and performance is up to understanding the business context. But even more importantly, it is up to the individual actors, who support others taking actions and will act by themselves, too. Essentially, further research is needed in order to better understand the constituents of success and performance in in different organizational contexts.

## 7. THE CHOICE AND USE OF NOVEL AND RELEVANT RESEARCH METHODS

### 7.1 Selection of the research methods in the project

One of the focal starting points in the NewBI5 project was the aim to increase understanding about management and managerial work in the current business contexts. The project combines multiple, seemingly clearly different approaches, that is industrial engineering and management, social psychology and signal processing, in order to better understand both the technical and social aspects of management. This was supposed to lead into a better understanding about more specific questions regarding the decision-making and management in the future, the role of technologies (such as AI) in the decision-making and management, and the role of different actors in the decision-making and management.

Regarding the choice of the research methods, quite importantly and surprisingly, all the different disciplines present in the project highlighted the need to understand the actual behavior of the actors involved in processes. For the researchers in the industrial engineering and management, this meant choosing interventionist research approach that includes different research methods for understanding and developing functioning practices in different organizations (see e.g., Suomala et al. 2014, Lyly-Yrjänäinen et al. 2017, Tiitola et al., 2020; 2021). For the researchers in the social psychology, the same fundamental starting point means collecting research data from authentic environments, with the people present in the real-life meetings and other occasions. For the signal processing researchers, the basis is real-life data that represents occasions that have actually taken place to understand and anticipate behavior also in the future. Altogether, this represents a solid and balanced starting point for the research method selection of the project.

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*“all the different disciplines present in the project highlighted the need to understand the actual behavior of the actors involved in processes”*

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In addition to the shared basis of the research method selection, the project took advantage of the unique access to different organizations, which enabled enacting the aforementioned principles. However, at the very beginning of the project, the particular methods were not chosen in a rigid way, instead there was an intention and several possibilities to refine the chosen methods along with the project execution. This is rather common and highly valuable in the ambitious, multi-disciplinary projects like the NewBI5 project at hand. Next, some highlights will be given on the more specific research methods chosen and used in the project.

### 7.2 Overview of the chosen methods and their justification

In general, the project employed multiple methods in different analyses related to the project. In this section, some highlights will be provided on them. The following research methods are thus presented in a more detailed manner: 1) longitudinal, interventionist case, 2) value analyses and estimations, 3) 360-degree camera data analyses, 4) content analyses, 5) natural language analyses, 6) statistical analyses on real-life data.

First, longitudinal interventionist case (Lyly-Yrjänäinen et al., 2017) is a research approach that was employed in most of the cases of the project. In this approach, the starting point of the research endeavor is the pre-understanding of the particular challenge(s) and the research setting



is designed in response to that. In the project, quite typically, the central stakeholders of the challenge were first interviewed, and other documents were analyzed to specify the research agenda and explore first possible solutions. In the agenda, the researchers designed frameworks, value analyses or other interpretations in response to the identified challenges, and once there were discussed with the stakeholders, more advanced or refined solutions were developed. Such iterative process was a basis for responding to the specific research questions of the case and the more generic research questions of the entire project. The advantage of the interventionist approach is the identification of the actual challenge and finding suitable means to overcome it. Obviously, a challenge is that the detailed research questions are defined at a relative late stage of the projects and therefore some of the challenges may remain unsolved. However, longitudinal setting enables more iterations than usually and therefore helps refining and solving the challenges, and also data collection in response to the specified research questions.

Second, value analyses and estimations are a typical form of the analyses in the project. These aim at defining and examining the value generation, business potential or current business impact of the given unit of analysis. These methods have been typically used in connection with the interventionist case studies, where the researchers have been collecting information about the central actors and the mechanisms of value creation. The analyses and estimations have usually taken the form of “accounting prototypes” (Wouters & Roijmans, 2011, Laine et al. 2016) or “vernacular accountings” (Kilfoyle et al., 2013), where relevant, operational information foster useful discussions and thus effective decision-making. As a research method, they not only provide information on the value generation as such, but they also provide wider perspective on the management, leadership and the desired changes in the business contexts under examination.

Third, the project developed new methods for data collection, because unique access was provided by the case organizations. In one case it was possible to record the discussions that take place in meeting room in a way that all the participants can be observed simultaneously. Such data is extremely helpful in better understanding interaction in meetings and other managerial occasions as a) it represents a real-life situation (in contrast to interviews) and b) it provides an extensive view on interaction, intervention and reaction. Furthermore, the researchers did not have to participate in many of those meetings, but they could take place with a “neutral” camera in place. This data was useful as it nicely supplemented other observations from the case and enabled combining management and social psychology analyses within.

Fourth, the research project employed extensively different content analyses, regarding both interviews and live meetings. These content analyses served as a basis for pre-understanding in many of the cases. Furthermore, in the project, an extensive interview study was conducted on non-routine decision-making and the potential of artificial intelligence, that examined several different organizations and decision-making contexts.

At the same time, the content analyses represent a solid basis for many research outputs. An example of a research output based on the interview study is the forthcoming study combining the use of financial information in decision-making and the discourses on the potential of artificial intelligence. For another example, social psychology researchers examined the discourses in one organization in order to understand the presence and peculiarities of the self-determination theory (SDT) (Deci & Ryan, 2012) in this context, as an enabler of self-organizing, successful organization.

Fifth, natural language analyses were employed in the signal processing studies. These were related to the analyses that combined numeric and text data with respect to the analyzed processes. The potential of the natural language analyses lies in its ability to unveil the logic within the data, typically beyond the statistical analyses of the numeric data. Regarding the examined process, it was possible to bring up associations of different events (i.e., if this happens, also probably that will happen too), and also the peculiarities of the process in different locations, with different technologies and as evolving over time. In connection with numerical analyses, the study proved to hold significant potential as part of the artificial intelligence utilization.

However, using natural language analyses requires several capabilities and resources: 1) the analyses were enabled by the signal processing competences of the project, 2) the analyses were enabled by the real-life data and the commitment of the participatory organization, and 3) the

analyses were conducted by a person that held a combination of technical and business capabilities. Under these circumstances, it is strongly recommended that also natural language, that is text can be more widely utilized in organizations for decision-making and wider managerial purposes.

Sixth, and finally, Statistical analyses on real-life data were conducted whenever needed in the project. It is noteworthy that despite the tendency towards interventionist case studies in the overall setting, quantitative data and analyses were used rather extensively. Some company cases utilized artificial intelligence algorithms in different parts of the project, by the signal processing researchers or external service providers. These analyses provided interesting research outputs as such and they also supported the overall research agenda within the cases.

### 7.3 Synthesis and recommendations

Altogether, the research methods employed in the project represent a unique combination of different empirical studies. During the project, the starting point has been the actual behavior, real-life cases and authentic data. Therefore, the identification of the challenges and the designed or identified responses to the challenges represent actual management challenges and opportunities. This has provided a solid starting point for responding to the research questions of the project, as outlined in the previous chapters.

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*“the project represent a unique combination of different empirical studies”*

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The uniqueness of the chosen methods does not lie in the multi-disciplinarity of the setup, but also in the development and selection of the methods along with the project. The list of methodological publications at the end of the report indicate that the research project has not only applied and combined existing methods but been exceptionally active in further developing and reflecting upon them. It is noteworthy that despite the great emphasis on the empirical data, the project is not only inductive, but inductive, deductive and abductive approaches were chosen whenever needed. The empirical world was, however, used continuously as a real-life laboratory for the project purposes – to identify the best possible findings and recommendations.

The project methods were chosen by following the aforementioned principles, in order to ensure the novelty and relevance of the findings. Regarding the organizations, in which the research project was conducted, this enabled an extensive attention to the organizations’ needs and thus tailoring the research endeavor accordingly. It is noteworthy that the organization specific plans were set in a rather detailed manner beforehand, but there were several occasions, where the plans were refined, and the research approach and methods were chosen accordingly. As a recommendation, we argue that combining artificial intelligence and other analyses with timely management challenges requires a lot of case-specific pre-understanding, and also rather tailored research approaches. The lessons learned from NewBI5 project indicate that results from such tailored approaches can still be put to wider contexts, compared and they thus constitute a solid basis for research contributions. Furthermore, the more actors, data and perspectives were included in the research by the project participants in the studied organizations, the more value the research project could bring – and eventually the more scientific output could be provided as well.

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*“the more actors, data and perspectives were included... the more value the research project could bring”*

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## 7.4 Lessons learned

Overall, NewBI5 project was a multi-disciplinary project, with several different case contexts and empirical approaches, largely tailored according to the understanding of those contexts. This principle was intentionally chosen and turned out to be successful along with the project, both in terms of the novelty and relevance of the results. As a result, we propose:

- Refining suitable approaches and methods based on context specific understanding seems to foster novel and relevant research findings.
- Multi-disciplinary research projects require extra attention to identifying the interesting and relevant research questions and tailoring the approach accordingly.

Furthermore, we have observed that extensive and/or longitudinal commitment of the participating organizations has significant positive effects on the practical and scientific output of the project. Due to the iterative nature of the empirical research, it was possible to make sure that the research effort continuously matched the practical and theoretical interests of the actors involved. Essentially, as the organizations aimed at growing international business potentials, the research was continuously refined according to this aim as well. Finally, we propose that:

- The focus on the participant organization's business potentials serves typically as a fruitful basis for research efforts.
- The more interesting the unit of analysis is for the participant organization, the more effort can be taken by it and thus, the more results may stem from the research project.

## 8. CONCLUDING REMARKS

Altogether, the NewBI5 project has been multi-disciplinary, multi-perspective project, with several rather longitudinal paths of research and development together with the research team and the organizations involved in the project. As outlined in the structure of the final report, there are several mechanisms to be identified, unveiled, studied and developed before the customer value generation and eventually international business growth will take place.

Indeed, this project has studied the management and organizational practices, featuring both human and technology-based advancements. Furthermore, the project has focused on different means of analyzing and enabling decision-making towards the extended value generation and thus unveiling opportunities for business growth. All these perspectives have taken places in parallel, simultaneously in many ways. Also, as conveyed in connection with the research methods, the choices have been partly made during the project, along the way of examining (researchers) and realizing (organizations) the business opportunities.

Building on the contents of this report, Figure 3 conveys the idea of refining and realizing the value and business potentials. Essentially, we have engaged with numerous different business areas, products, services and growth potentials (the left side of the figure). The project has focused on understanding the management processes, and more importantly, finding ways to identify, examine and further refine the impact of the relevant business potentials. Those streams of research that have been followed and examined in a longitudinal manner have developed into concrete service, product and value generation possibilities, that is the possible diamonds in the right side of the figure.

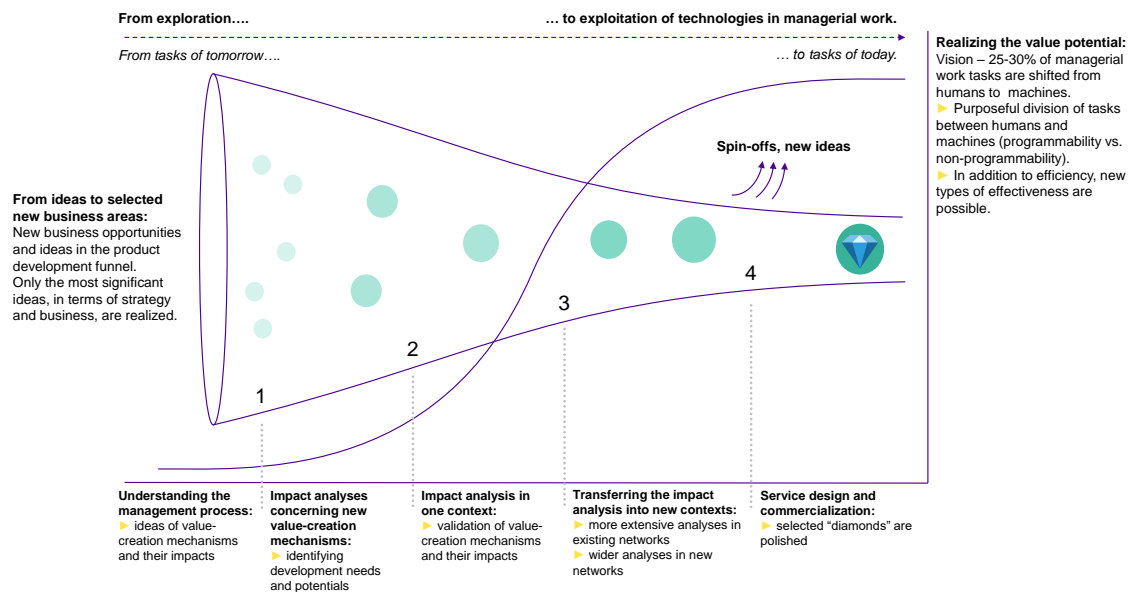


Figure 3 The logic of identifying and realizing business potentials based on the project.

As conveyed in the figure above, the research project has been quite directly involved in the relevant, prioritized business development avenues of the organizations involved. The research project has built capabilities for those business development potentials, helped identifying and refining them, and eventually, through interventions, helped realizing some of them. Altogether, the project has allowed new business opportunities to emerge and selected and examined them as chosen and prioritized by the parties involved. This has enabled continuous novelty and relevance of the project activities.

## 9. PROJECT PUBLICATIONS AND DISSEMINATION

### Further readings published during the project: Section 1 Introduction

- Laine, T. (2018). New competitiveness and Business Impact from Intelligence, Intuition, Integration and Interaction (NewBI5), IEM management accounting days at LUT. 1.-2.11.2018.
- Laine, T., Tiitola, V. (2018) Employing pragmatic constructivism for unveiling and overcoming the actors' limitations in managerial processes and decision-making, VIII conference of the Actor-Reality Construction in Pisa 10/2018.
- Tiitola, V., Korhonen, T. & Laine, T. (2019) Kannattavuuden johtaminen digitalisaation ja tekoälyn murroksessa, ProMaint.

### Further readings published during the project: Section 2 Human-based and technology-based management

#### *Human-based management:*

- Ahopelto, T., Tiitinen, S., Korhonen, T., Ruusuvoori, J., Laine, T. 2019. Päätöksenteko itseohjautuvassa organisaatiossa (In Finnish). Työelämän tutkimuspäivät 2019, Tampereen yliopisto, 7.11.- 8.11.2019.
- Korhonen, T. 2021. How the organizational culture controls the micro-practices of work in a radically decentralized organization: a conversation analysis. 2nd Qualitative Management Accounting Research Group (QMARG) Paper Development Workshop.
- Korhonen, T.; Laine, T. (2019). Language games in managing a business without any superiors. An abstract presented at "A Pragmatic Constructivist Workshop", Berlin 23-24. May, 2019.
- Korhonen, Tuomas; Ahopelto, Teija; Laine, Teemu; Ruusuvoori, Johanna; Tiitinen, Sanni. (2020). Perspectives to management language games and social interaction in self-managing organizations. *Proceedings of Pragmatic Constructivism*, 10(1), 3-10. <https://doi.org/10.7146/propracon.v10i1.119251>
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#### *Technology-based management:*

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