BACHELOR'S THESIS

Analysis and proposal of process optimization of employee attendance monitoring

Analýza a návrh procesu evidence docházky zaměstnanců

STUDY PROGRAM

Ekonomika a management

SUPERVISOR

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ZADÁNÍ BAKALÁŘSKÉ PRÁCE

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BASL, Josef a Roman BLAŽÍČEK. Podnikové informační systémy: podnik v informační společnosti. 3., aktualiz. a dopl. vyd. Praha: Grada, 2012. Management v informační společnosti. ISBN isbn978-80-247-4307-3.

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Abstract

This Bachelor's thesis engages the topic of business processes, their performance, business process modeling using BPMN, and economic analysis of a change to a business process. Its objective is to describe, analyze, model, and propose a change to a business process.

In the practical part, the thesis focuses on an employee attendance monitoring process in the company Vivacomex. The company's process is modeled, analyzed and a change to the process is proposed. The subsequent analysis of the change to the process found a positive impact on the process's performance. Finally, an economic analysis using Net Present Value found the change had an economic benefit for the company.

Key words

business processes, BPMN, economic analysis, process performance, NPV

Abstrakt

Bakalářská práce definuje pojmy podnikové procesy a jejich výkon. Zaměřuje se na jejich mapování pomocí notace BPMN a ekonomické zhodnocení investic. Hlavním cílem je popsat a vypracovat analýzu a model podnikového procesu.

V praktické části se práce zaměřuje na společnost Vivacomex a její proces monitorování docházky zaměstnanců. Po analýze podnikového procesu je navržen zoptimalizovaný proces. Tento podnikový proces je dále popsán, analyzován, je vypracován jeho model a návrh na změnu. Následná analýza změny procesu objevila zlepšení výkonu daného procesu a ekonomický přínost pro firmu.

Klíčová slova

podnikové procesy, BPMN, ekonomické hodnocení, výkon procesů, NPV

Contents

Introduction

The Bachelor's thesis analyzes, models, and proposes changes to an employee attendance monitoring process in the company Vivacomex.

The thesis is divided into a theoretical part that defines terms such as a business process, process components, boundaries, and categories. Furthermore, it defines the dimensions for process improvement and criteria for choosing a process for improvement.

The second part of the theoretical part introduces the BPMN standard, its elements, and how they are used to model business processes and software tools used for modeling processes.

The third chapter discusses methods for economic analysis of investment and how they are in the evaluation of investments.

The practical part first introduces the company Vivacomex and its business. Then it proceeds to describe, analyze, and model Vivacomex's Employee Attendance Monitoring process. Modeling of the process is done through the Bizagi software using BPMN, which is introduced in the theoretical part.

The following chapter proposes a change to the process that aims to improve the Employee Attendance Monitoring process's performance.

The final chapter analyzes the benefits that the proposed changes to the process have brought. Finally, the thesis analyzes the economic impact of the change and assesses the viability of the investment associated with it.

THEORETICAL PART

1 DEFINITION OF BASIC TERMS IN BUSINESS PROCESSES

1.1 Business process

A business process is a specific sequence of structured functions or activities at a specific time that produce a service or a product that delivers value for an internal or external customer. It has a clearly defined start that is initiated by an event. These events have no duration and trigger the execution of the sequence of activities. At the most fundamental level, business processes have 3 components: inputs resources, activities, and outputs that are the result of the process transforming the inputs (Řepa, 2012; Conger, 2011; Krogstie, 2013; Kirchmer, 2017; Slack and Brandon-Jones, 2018). Figure 1 is a representation of this model.

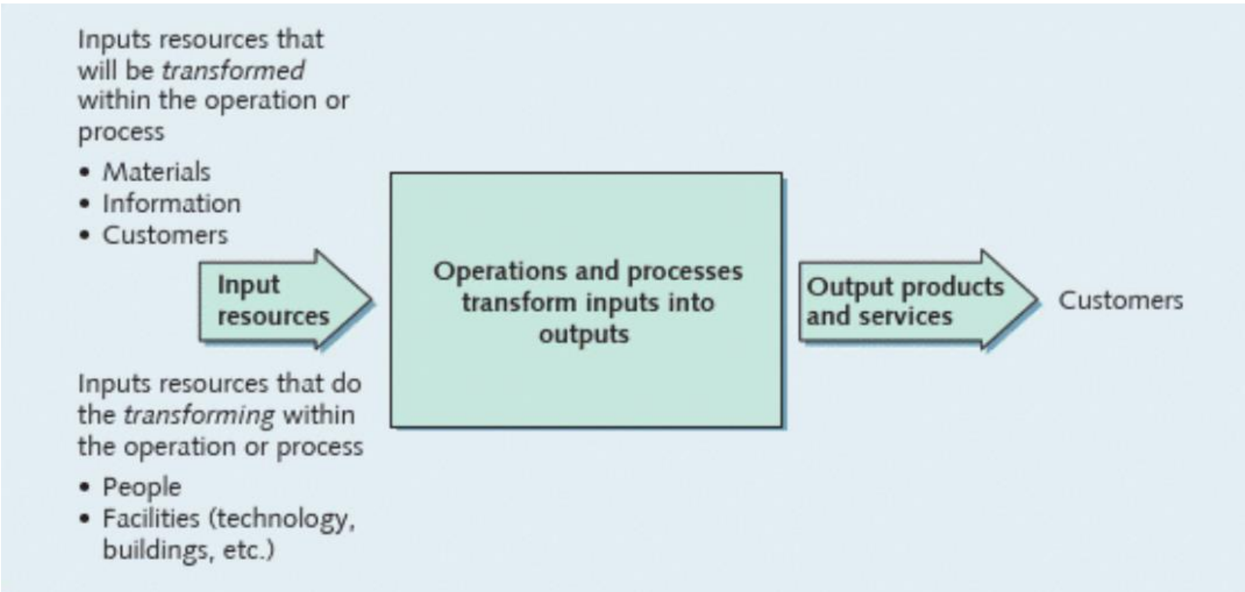


Figure 1: Basic components of a process (Slack and Brandon-Jones, 2018, p. 10)

As mentioned earlier, an event triggers the execution of a process (its activities). This initiation creates an instance of a process. An instance of a process is a singular run of the activities specific to a particular time. Time is an important attribute of a process as every process instance and its activities take place at a certain time and have a duration. An event could be the arrival of inputs, a command to start the process, or a precise time, e.g. 12:15 or every 30 min.

Every process has identifiable boundaries and measurable parameters, through which the efficiency (costs) and effectiveness (added value to the customer) are measured. Processes are characterized by their repeatability and standardization (Řepa, 2012; Basl a Blažíček, 2008).

1.2 Process components

Input resources can be divided into the transformed and transforming resources. The transformed resources are inputs that are changed within the process into the outputs that are delivered to the customer. Transforming resources are the facilities and people who process the transformed resources. Facilities are the tools, equipment, plants, and technologies used to process the inputs. The people operate these facilities and execute the transformation of transformed inputs (Slack and Brandon-Jones, 2018).

The transformation component is the activities that create outputs. If an Activity is simple and can be measured as a single unit of work done by an individual, it is called a task. However, if the work is more complicated and requires multiple steps then it is called an Activity. Moreover, activities and tasks have several attributes. These are a specific duration, logical connection to other activities and tasks in the process, and they have assigned resources that are utilized in the transformation. The utilization of resources creates costs for the process. Using these attributes, the transformation process can be separated into individual activities. Svozilová (2011) defines an individual Activity as all the work that can be done before a decision must be made about where the process goes next and in a logical timeframe, e.g. before different tools or procedures must be used.

The output of a process is a product or a service. These should be made to satisfy the requirements of the customer of the process. As a result, the output should bring value or satisfy some needs of the customer. If the customer is outside the organization, they are an external customer. External customers often pay the outputs. If the output serves as an input to another process in the organization then they are called an internal customer. In other words, anyone affected by the output, individuals, groups, departments are all internal customers (Svozilová, 2011; Slack and Brandon-Jones, 2018).

1.3 Process boundaries

Processes take place in a dynamic environment and are often interlinked with each other. They often cross-functional departments of an organization or even the boundaries of the organization itself. Moreover, they operate in a dynamic environment where at any point in time each process in a business is in a different stage of execution, they are started, stopped, or interrupted by events and undergo changes continuously. As a result, to properly describe, document, analyze, and improve a process it is necessary to first be able to separate it from its environment. In other words, the process's structure and stakeholders must be identified. This enables focus on areas of interest for the process. One of the tools for identifying the boundaries of a process is a SIPOC diagram. It helps to identify the suppliers and the inputs that they deliver into the process, what activities take place in the process, what are the outputs of the transformation, and finally, who is the customer of the process. Through this analysis, the process stakeholders can better understand and agree on what is the process involves and where does it fit in the business (Svozilová, 2011, Dumas et al, 2018; Slack and Brandon-Jones, 2018).

Furthermore, it can also start facilitating the questions and discussions about what information must the supplier provide, who is responsible for processing this information, who is responsible for each task or Activity in the process, how should the process be evaluated and who should be aware of the progress of the process (Slack and Brandon-Jones, 2018).

1.4 Process actors

Every process involves process actors, who are stakeholders in a process. Actors can be human beings, organizations, or software systems that act on the behalf of organizations or humans. These actors can be further grouped depending on their role in the process. People internal to the organization who operate the process are process participants. They execute the activities and influence the performance of the activities and tasks that are assigned to them within the process. A business party is an external process actor who performs the process activities outside the organization.

A manager of a process is directly responsible for the quality of outputs and the performance of the process. Therefore, they manage the process, control its activities, and have the authority to change the structure of the process to improve it. A supplier or business party is a participant of the process who provides the inputs for the process to transform into outputs for customers. A customer is a person or a party whose needs are satisfied by the outputs of the process. In other words, the outputs have value in the eyes of the customer (Svozilová, 2011, Dumas et al., 2018).

1.5 Process objects

A process involves physical objects and informational objects. These objects are what the process participants use and consume in the process. Physical objects are the equipment that participants use, materials are the inputs that they transform, and the product is what the customer utilizes or consumes. Informational objects are electronic or paper documents and records that can be the inputs, resources, and outputs of the process (Slack and Brandon-Jones, 2018).

1.6 Process categories

One of the methods for categorizing business processes is Porter's Value Chain. In it business processes are categorized as core, supporting, and managing. Their distinction is of strategic importance to a company (Cienciala, 2011; Dumas et al, 2018).

Core business processes directly add value to the customer. Through each Activity of a core process, a product or service is developed into a final product for which the customer pays. Among main business processes are research and development, production and customer services, marketing and sales, and direct procurement (i.e. sourcing needed to make the product or delivery of services).

Supporting processes add value to the customer indirectly by enabling the execution of the core processes. These include indirect procurement (machinery, stationery, furniture), information technology management, human resource management, plant maintenance, accounting, and legal services for example.

Management processes provide directions, rules, and practices for the other two categories of business processes. Examples of these are strategic planning, budgeting, compliance, and risk management (Dumas et al, 2018). It is of strategic importance for the company to correctly distinguish between core, support, and management processes (Cienciala, 2011).

1.7 Optimizing business processes

The ultimate intention behind improving business processes is to improve the performance of the business itself. To determine if a process is doing well or not, its performance must be measured. In general, four basic performance measures are observed: time, cost, quality, and flexibility. The first three reflect the most fundamental way people think about improving performance: faster, cheaper, and better. The last performance dimension flexibility addresses the ability of a process to deliver consistent results in changing circumstances. Under normal circumstances, the process might be achieving high-quality, low-cost, and timely delivery. However, can the process deliver the same results if there are sudden spikes in demand or the conditions around the process change? The flexibility of a process measures exactly that (Dumas et al, 2017; Slack and Brandon-Jones, 2018).

These four performance dimensions can be refined into more detailed process performance measures, also called key performance indicators (KPI). KPIs should have a clear definition and be unambiguously determined if the data for them is available. Cost can be refined into smaller measurable indicators such as input material costs, human resource costs, operational costs, investment costs. These can be refined into even more specific measures. However, it is also possible to aggregate the performance dimensions into KPIs such as overall customer satisfaction, achievement of financial goals, and so on. (Slack and Brandon-Jones, 2018).

The following paragraphs will discuss the four fundamental performance measurements in more detail.

Quality – quality can be viewed from two different perspectives. From the customer side (external quality) or process participant's side (internal quality). The external quality can be measured as the client's satisfaction with either the process or the product. Satisfaction with the product can be defined as: "Did the product specification meet the client's expectation?" or "Did the level of service meet the expectations of the client?", etc. In contrast, the quality of the process measures the client's satisfaction with the amount, relevance, quality, and timeliness of the information they received when the process was carried out. The internal quality looks at the process from the process participant's point of view. This can be expressed as: how in control of their work does the participant feel, the level of variation they have experienced in the process, or if they find the process difficult to navigate.

Time – this dimension measures the duration of activities, Subprocesses, or the process as a whole. One of the most common time-related KPI in processes is throughput time. It measures the amount of time between the input entering the process transformation and the directly linked output leaving the process. One of the most common goals in process optimization is reducing the throughput time. This goal can be achieved in multiple ways such as reducing the maximum throughput time or the variation in the throughput time. The latter is an area of focus in the continuous process improvement approach discussed above. Another way to lower the throughput time is by reducing the waiting time. It is the time that a case is not being processed. This includes queueing time – waiting time caused by lack of available resources for processing the case. Waiting time also includes the time a case spends waiting for other processes or activities to synchronize or when the process needs additional input from external parties.

Costs – this dimension also captures variables such as yield, revenue, or turnover and not only the pure costs of a process. Process costs can be divided into fixed and variable costs. Fixed costs are overhead costs that are almost independent of the intensity of processing. On the other hand, variable costs (e.g. number of employees) increase along with the volume of processing. A KPI that is often measured is operational cost. Operational costs can be directly linked to the outputs of the process. In process redesign, operational costs are often targeted. In particular, efforts focus on decreasing labor costs. This is often achieved by automation.

Last but not least, the flexibility criterion which is often overlooked. This attribute can be generally defined as the process's ability to react to changes. For example, how can a business process handle changes in the conditions surrounding the process, resources, or workloads? Does management have the ability to change the structure and rules of the process? Does the organization have the ability to adjust business processes in response to changes in the market or customer needs (Dumas et al, 2018; Slack and Brandon-Jones, 2018)?

A business first needs to set performance objectives before it can define performance measures. Performance objectives are a high-level state of the process that the business wants to achieve. For example, the customers of a business want to have products delivered in 2 days. Therefore, the performance objective is to deliver the products in less than 2 days. This objective can then be used to define desirable performance measures, e.g. the mean delivery time is 2 days, or to maximize the number of deliveries taking less than 2 days.

1.8 Selection criteria for improving business processes

Improving business processes requires time, effort, commitment, and financial resources. Therefore, it is important to carefully select which processes to improve. On the other hand, if a process creates losses, it should be considered for elimination (Basl a Blažíček, 2008; Dumas et al, 2018).

The most common criteria for selecting processes for improvement are strategic importance of the process, process health, and feasibility of improvement. The strategic importance measures the impact of a process on the business's ability to achieve its strategic goals. Processes with the most significant impact on the achievement of strategic goals should be selected for improvement. Such processes usually influence profitability, bring a competitive advantage, or uniquely distinguish the organization.

The second criterion for improvement is the health of a process. The processes that are the most dysfunctional or have the highest inefficiencies should be prioritized for improvement.

Lastly, not all processes can be as effectively improved. Politics and organizational subcultures associated with a process can create limitations on the effectiveness or success of improvement initiatives. As a result, efforts should be focused on processes that have a high probability of successful improvement implementation (Dumas et al, 2018).

2 STANDARDS FOR PROCESS MODELING

Models of business processes capture the current state and structure of business processes. The graphical representation of processes helps gain a better understanding of the roles, tasks, and critical areas in the process. Therefore, the goal of creating a process model is to understand the process's structure, characteristics, and functionality (Kantnerová et al, 2016; Dumast et al, 2018). These models describe how products or services are created, what resources and data they require, and what parts of the organization need to be involved. A model facilitates sharing a common understanding of processes in the organization. Since process participants often only perform specialized activities in a process they will rarely be exposed to the full complexity of the process. The improved understanding of the process enables identifying and preventing issues. This thorough knowledge of a business process is a prerequisite for improving it (Dalal et al, 2004; Dumas et al 2018; Cienciala, 2011).

Business processes must be not only well defined but also accurately identified. This is the responsibility of the organization's management. Identification of processes involves a breakdown of processes into smaller components such as activities. Using this breakdown, analyses of processes can be done and critical areas for improvement identified. These analyses are the foundation of process models and maps. The main objective of process analyses, maps, and models is to help find the relationships and interactions between processes, mistakes, and inconsistencies. As a result, inefficiencies can be eliminated and processes improved.

2.1 BPMN 2.0

Business Process Modeling Notation is a standard business process modeling language. BPMN is used to create business process diagrams (BPDs). The structuring elements (groups, swim lanes, and pools) are utilized in BPMN Diagrams for differentiating between sections, actors, and processes. An advantage of BPMN is that it is easily understandable by all business users. However, is it still a robust and complex language with over 100 symbols. As a standardized metamodel with a serialized format, it allows the exchange of business process models between multiple software solutions, making it highly versatile. In 2011 the BPMN was updated into BPMN 2.0 (Krogstie and Aagesen, 2015).

2.2 BPMN elements

2.2.1 Events

The 3 basic concepts in BPM are events, activities, and sequence flows (or arcs). This reflects the core elements of processes which are the events that start process activities that happen in a logical sequence.

Events are represented by circles. The 2 most basic event symbols are the Start Event and End Event. The Start Event has a thin circle while the End Event has thick borders. While color schemes are used in some modeling solutions, e.g. Bizagi, to make the difference clearer, in BPMN 2.0 colors are not used as a differentiating factor. The Start Event shows a start of an instance of a process and the End Event shows when the instance is complete. A concept signifying the progress of the instance is a token. The start of the process creates a token that travels through the model and signifies at what stage the process is in. It is represented by a dot. The token is destroyed when it reaches the End Event. It is common practice to name the events to communicate what events start the instance and what is the outcome of the process. Table 1 shows the notation of Start and End Events (Dumas et al, 2018).

Name	Notation	Description
Start Event		Indicates an event that initiates the instance of the process
End Event		Indicates when the process is complete
Timer Start Event		This indicates that a process starts only at a specific date or cycle time
Intermediate Timer Event		Represents a delay in the process. It can only be inside sequence flows to indicate a waiting time between activities.

Table 1: Events (Bizagi, 2013)

In BPMN there are also timer events. Timer Events indicate that a process instance starts when a specific temporal event takes place, e.g. every end of the month, every day at 6 a.m., etc. It can be also used as an intermediate event. Intermediate events are events that occur when the process is already in motion. A token is trapped in a sequence flow that enters the intermediate event until the event takes place. When the event happens, the token passes that event immediately and continues in the process flow. An intermediate Timer Event pauses a process until the timer event occurs. The process can only react to the timer and never generates it. Timer Events are indicated by a circle with a watch inside it. If the timer event is intermediate, it has a double border. Intermediate events are represented by a circle with a double border.

Activities are represented by rounded rectangles. It is recommended to label activities with a verb in the imperative form followed by a noun that refers to a business object, e.g. Send invoice. Adjectives and adverbs can be used as well but the labels should be kept short to ensure the readability of the model.

Sequence flows are represented by arrows with a full arrowhead. As mentioned earlier, they show the logical sequence of activities.

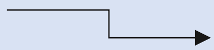
Name	Notation	Description
Activity		An action in a process that transforms inputs into outputs
Sequence flow		Shows the logical order of activities

Table 2: Activities and sequence flows

BPMN also utilizes pools that show the boundaries of a process. Everything contained within a pool is part of a single process. Pools can be divided by Lanes. They are used to differentiate between process participants, roles or departments, etc. In essence, they separate responsibilities for activities. Their notation and short description are depicted in Table 3.

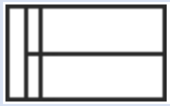
Name	Notation	Description
Pool		A pool contains a single process. It is used to delineate the boundaries of a process.
Lane		Lanes are used to divide pools. They divide responsibilities and differentiate roles, departments, teams, etc.

Table 3: Pool and Lane (Bizagi, 2013)

2.2.2 Business Objects

BPMN models also often include business objects. They are objects activities require to be executed or are a result of activities execution. The two most common business objects are Data Objects and Data Stores. Data Objects represent information or material that flows into or out of activities. They can be physical, such as paper documents, materials, work-in-progress products, or electronic, such as a digital invoice, reports, and emails. Another business object is Data Store. While Data Objects are created or used within an instance of a process, Data Stores are places that contain Data Objects that exist beyond the scope of the process or the duration of a process instance (Dumas et al., 2018). A dotted arrow with an open head called Data Association is used within BPMN to show if a business object is an output or input of an Activity. If Data Association starts at the business object and the arrow connects to an Activity, it means that the business object is an input for that Activity. If the direction of the Data Association would be opposite, it means that the business object is the output of that Activity. The objects and Data Association are depicted in Table 4.

Name	Notation	Description
Data Objects		Represents information and material flowing in and out of activities
Data Store		A place containing Data Objects that exist beyond the duration of a process instance
Data Association		Associates business objects to Activities

Table 4: Business Objects (Bizagi, 2013)

2.2.3 Branching and Merging

Activities are not always executed sequentially. Some activities might be mutually exclusive and others may be executed in parallel. The BPMN uses gateways to model this behavior. As the term implies, gateways have a mechanism that either allows or disallows the passage of tokens through them. Depending on the type of the gateway, tokens can be merged together or split apart in a gateway. In a split gateway, the process flow diverges (tokens are split apart on output), whereas in a join gateway the process flow converges (tokens are merged together on input). A single gateway can be either the split or join type. Therefore, one gateway cannot have multiple sequences flows entering and exiting (Dumas et al., 2018).

There are numerous subtypes of gateways. For example, exclusive gateways are used to mode mutually exclusive activities. When a token enters an exclusive split gateway, it will follow only one outgoing branch/path from the gateway based on prespecified conditions. A process flow that is split by an Exclusive Gateway must be merged in an exclusive-join-gateway where the mutually exclusive branches are joined. When a token arrives at the exclusive-join-gateway it immediately passes through.

When multiple activities are not interdependent and can run concurrently, Parallel Gateways are used in the model. A token that goes into the split-parallel-gateway is split and follows all the branches the come out of the gateway. When any of these split tokens reach the join-parallel-gateway, they wait until tokens from all parallel branches reach the join-gateway, merge into one and then leave the gateway.

Name	Notation	Description
Exclusive Gateway		Split-exclusive-gateway creates mutually exclusives alternative paths. Join-exclusive-gateway merges mutually exclusive alternative paths
Parallel Gateway		Split-parallel-gateway creates alternative paths without any conditions. Joi-parallel-gateway merges alternative process flows. It waits for all tokens to arrive before proceeding.

Table 5: BPMN Gateways (Bizagi, 2013)

2.2.4 Process Decomposition

As the complexity of processes increases, the models of these processes grow in size as well. This can result in models having low understandability as they are crowded with elements. This can be resolved by using Subprocesses to hide parts of the model and increase the model's overall simplicity. A Subprocess is a self-contained, composite Activity that can be divided into smaller activities or tasks. Groups of related activities that have a common outcome or output can be compiled into a Subprocess. These groups can be replaced by a single Subprocess Activity element in the process model. The resulting decrease in the number of elements in the model improves readability. This type of Subprocess that hides its elements inside is called a collapsed Subprocess. It is represented by an Activity notation with a plus sign inside as seen in Table 6.

Collapsing a group of elements into a Subprocess does not equal losing its content. The Subprocess can be modeled in a different diagram at a lower abstraction level and attached to the higher abstraction level diagram. Software modeling packages also enable expanding a Subprocess to view its more detailed breakdown. Subprocesses have their own defined Start and End events.

A special type of Subprocess is the Multi-instance Subprocess. The Multi-instance Subprocess is repeated like a loop, creating multiple instances in the process. The instances can be created in a sequence or parallel. Each instance creates a token and when a predetermined condition of the loop Subprocess is met, all but one token are destroyed and continues in the process flow.

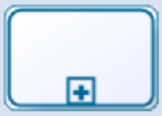
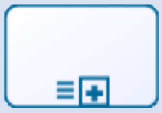
Name	Notation	Description
Subprocess		A composite Activity that hides/replaces a model with Activities, Gateways, Events, and sequence flows.
Multi-instance parallel loop		A Subprocess that runs multiple instances in parallel.
Multi-instance sequential loop		A Subprocess that runs multiple instances sequentially.

Table 6: Subprocesses (Bizagi, 2013)

2.3 Software tools for modeling business processes

Business processes can be modeled using software tools called Computer-Aided Business Engineering (CABE). They enable modeling organizational structures, business processes, and their analyses, and simulation. CABE tools provide facilitate modeling in areas such as:

- Goals of the business and their link to processes that support these goals
- Organizational structure and the representation of its links to processes
- Topology of the business, in other words, a graphical representation of its geographical structure
- Process modeling and process analysis. This includes showing the links to other models. In this area the content of the processes, such as what elements are in

the process, process hierarchy (defining subsystems and the interconnectedness to organizational structure), monitoring of processes (evaluating processes and defining their performance metrics), and simulation of processes in operation.

- Modeling of the process surroundings, e.g.if external elements affect processes, the tool should include it in the models (Řepa, 2012)

CABE tools should be equipped with model drafts of processes, functionalities enabling collaboration between analysts for creating models, connecting multiple models. They should also have a built-in consistency check that ensures the models do not have contradictory elements and are cohesive.

Software tools for creating business process models are Bizagi Modeler, Modelio, Dia, and Aris Express.

3 METHODS FOR ECONOMIC ANALYSIS OF INVESTMENTS

Investment can be defined as an acquisition of resources that will bring in income in the future. A business needs to make investments, in order to be viable in the long term. Scholleová (2017) specifies 3 key attributes of investments:

1) At the beginning they require a one-time or short-term significant financial expenditure

2) Investments are used to acquire fixed (long-term) assets

3) The acquired resource generates income over a long period of time.

When evaluating the feasibility of an investment, the investor should first find out key attributes of the prospective asset such as what are the upfront costs, the service time (lifetime) of the acquired asset, expected increase in income, and maintenance costs of the asset. After gaining this information, an economic analysis of the investment can be executed. There are various methods for conducting these analyses that can be divided into 2 main groups. Those are static and dynamic methods (Scholleová, 2017).

3.1 Static methods

Static methods only take into consideration cash flows associated with the acquisition and operating of an asset. In particular, static methods compare the cash flows from an investment and compare them to the initial acquisition cost in multiple ways. While they are simple and easy to do, they do not evaluate risks associated with the investment. Various static methods are explained in the following section. All of the following formulas are taken from Scholleová (2017, p. 124-25).

1) *Total cash flow* (TCF) from investments method calculates the net cash flows from the investment over the lifetime of the asset. CF_i is the cash flow in the year *i.*

$TCF = CF_1 + CF_2 + \cdots + CF_n = \sum_{i=1}^{n} CF_i$, where CF_i is the cash flow in the year i

2) Net total cash flow is the total cash flow minus the initial investment cost. *IN* is the initial investment cost and *TCF* is calculated as in formula 1)

$$NCF = TCF - IN = -IN + \sum_{i=1}^{n} CF_i$$

3) Average yearly cash flow from the investment, where n is the lifetime of the asset in years

$$\emptyset CF = \frac{TCF}{n}$$

4) Average yearly return on the investment

$$\emptyset r = \frac{\emptyset CF}{IN}$$

5) Average time of return on investment

$$\emptyset time = \frac{1}{\emptyset r}$$

3.2 Dynamic methods

On top of incoming cash flows, dynamic methods for analyzing investments also take into consideration time and risk. To account for these 2 factors, dynamic methods use discounting. Discounting is a method for determining the present value of an investment based on future cash flows using discount rates. Discount rates can be either reflect the cost of capital or the rate of return on risk-free investments, e.g. government bonds. In the former case, WACC (weighted average cost of capital) is used. WACC is the average cost the company pays for capital from borrowing, selling equity, or the desired rate of return on equity from shareholders (Synek et al, 2007). All of the following formulas are taken from Scholleová (2017, p. 132-137) and Synek et al (2007, 295-297).

1) *Net Present Value* (NPV) is one of the most common methods for assessing the financial viability of investments. If the NPV is positive, that means that the investment brings in higher returns on investment than the discounting rate. Therefore, the investment is desirable. When NPV negative, then the investment should be rejected. The initial cost of the investment is *IN*. The lifetime of the asset is *n*, CF_t is the cash flow in year *t*. Finally, *i* is the discount rate of return that could be earned from an alternative investment.

$$NPV = -IN + \sum_{t=1}^{n} \frac{CF_t}{(1+i)^t}$$

2) *Internal Rate of Return* (IRR) is the rate of return that will give NPV = 0. This method helps determine what will be the rate of return on the investment. If the calculated IRR is higher than WACC or the other rate of returns that are used for reference, then the investment should be made.

$$-IN + \sum_{t=1}^{n} \frac{CF_t}{(1+IRR)^t}$$

3) *Profitability Index* (PI) measures the present value of the investment against the initial expenditure. If the PI is greater than 1, then the investment is acceptable. The greater the value of PI, the greater the profitability of the investment.

$$PI = \frac{PV}{IN} = \frac{\sum_{t=1}^{n} \frac{CF_t}{(1+i)^t}}{IN}$$

PRACTICAL PART

4 IMPORTING COMPANY BUSINESS PROCESSES OPTIMIZATION

For the practical part of my dissertation, I have chosen to analyze the business processes of the company Vivacomex. It is a specialist wholesale supplier of imported goods. Vivacomex is an importer and wholesale supplier of Asian goods and food. Vivacomex sources its products from business partners in Asia, usually other wholesale suppliers or directly from producers, and distributes them in the EU. They import goods varying from rice, dried foods, electronics, condiments, and beverages.

The company is based in the Czech Republic, including its management, sales department, distribution workers, and an accountant team. The company employs 25 people and its organizational structure is as follows:

A Chief Executive, sales team (consisting of salesmen, an academic researcher, a translator), a financial accountant, and a payroll accountant. In each of their 2 distribution centers, a manager, a supervisor, and drivers/warehousemen are located.

Figure 2 illustrates the map of business processes that take place at Vivacomex. They are divided into main, supporting, and management.

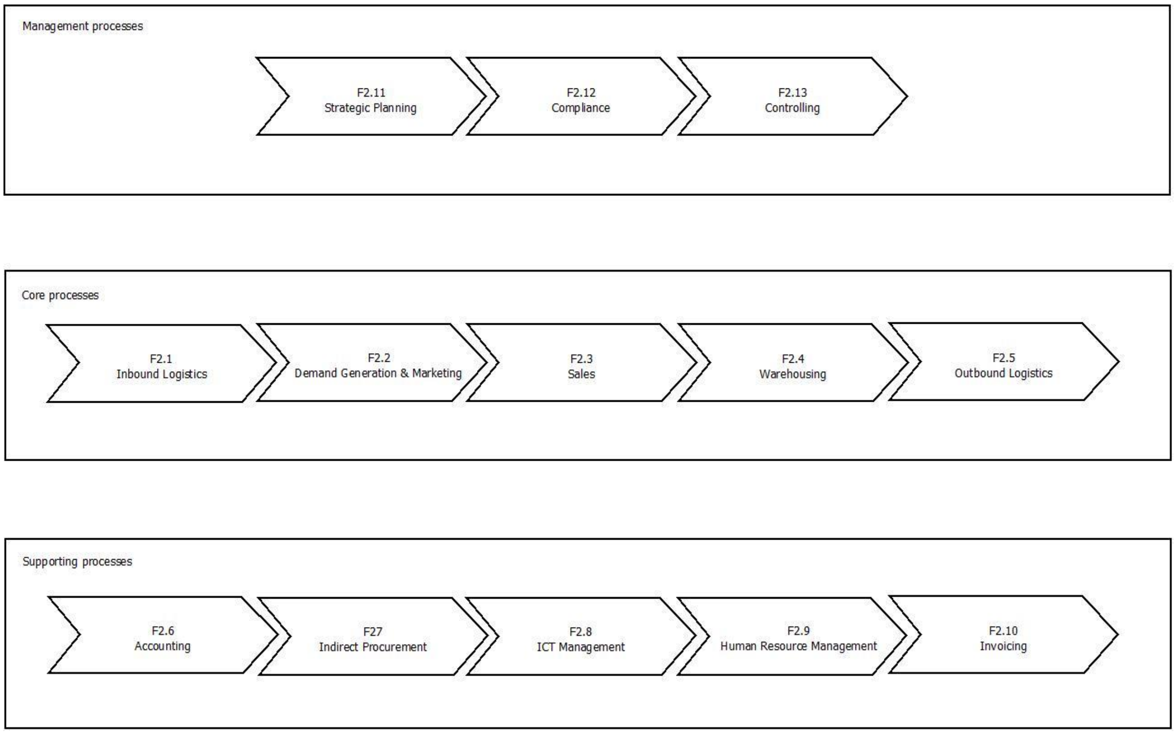


Figure 2: Business process map of company Vivacomex

The core business of the company is formed by a group of business processes that consists of Inbound Logistics (F2.1), Demand Generation and Marketing (F2.2), Sales (F2.3), Warehousing (F2.4), and Outbound Logistics (F2.5). The core processes of a business are enabled by supporting processes. For example, Sales (F2.3) are supported by Invoicing (F2.10), ICT Management (F2.8), and Indirect Procurement (F2.7). Strategic Planning (F211), Compliance (F2.12), and Controlling (F2.13) are part of management processes. These are high-level processes that can be further divided into smaller Subprocesses. For instance, Sales can be divided into a business proposal, sale quotation, negotiating, and post-sale service.

4.1 Employee Attendance Monitoring process

One of the business processes that are part of Human Resource Management is Employee Attendance Monitoring. It is classified as a supporting process since its customer is internal to the company and it supports core processes such as Warehousing, Inbound and Outbound Logistics.

The output of this business process is an input for the payroll accounting business process.

The following subchapters contain the description of the original state of the Employee Attendance Monitoring process, its analysis, a proposal for optimization, and realization of the optimization. The process proposed for optimization involves only the warehousing operations of the company. This is due to the fact that the working hours of the warehousing workers are fixed and their salary is based on the number of hours worked. Therefore, their work attendance must be monitored. However, headquarters-based employees have flexible working hours. As a result, their working hours are not monitored and not part of the analyzed process.

4.2 Description of the original state of the Employee Attendance Monitoring process

Employee attendance at Vivacomex is monitored through a register book where the employees fill out information including date, first and last name of the employee, time of arrival to the warehouse, time of departure from the warehouse, work breaks with leave and return times. Work breaks are monitored for cases when an employee must leave during his or her working hours for a medical checkup etc. Figure 3 shows an attendance sheet in an attendance register used by the company Vivacomex.

Datum	Příjmení, jméno	Příchod	Odchod	Přerušení pracovní doby				Odpraco-vaná doba	Důvod odchodu v pracovní době (navštívené místo)	Podpis (zaměstnance)	Podpis (vedoucí)
				odchod	příchod	odchod	příchod				

Figure 3: Employee attendance sheet

In the following paragraphs, the process is described for warehousemen attendance monitoring. However, the supervisors also have to record their attendance. When recording their attendance, the process is identical, except that they approve their work break permits themselves.

Every instance of the process of Employee Attendance Monitoring monitors the attendance of a single employee throughout the month. The model of the process is in Figure 4. The process starts at the beginning of every month. After the process starts, the daily attendance of an individual employee is recorded in the Subprocess Daily Employee Attendance Monitoring (F4.A1). The daily attendance is recorded in the Attendance Register (F4.D1). At the end of every month (F4.A2), the supervisor retrieves the Attendance Register, work break permits, and vacation records of an employee for that month and starts checking the accuracy of the data. If they find any inaccuracies or inconsistencies they correct them. Afterward, they proceed to calculate the sum of the employee's working hours, the total paid overtime hours of the employee, the sum of the total work break time, and vacation time (F4.A3). Once they are finished calculating and writing down all of these, they sign the results. These signed results are a document called Employee Attendance Monitoring Totals (F4.D4). This document is the output of the Employee Attendance Monitoring process and is then, along with the Attendance Register, vacation records, and work break permits delivered by the supervisor to the payroll office in the company headquarters. These paper documents are then used by the payroll accountant in the payroll accounting process. The payroll accountant enters the sums of worked hours, work break time, overtime, and vacation records into a digital form in a software application for calculating the monthly salaries of employees.

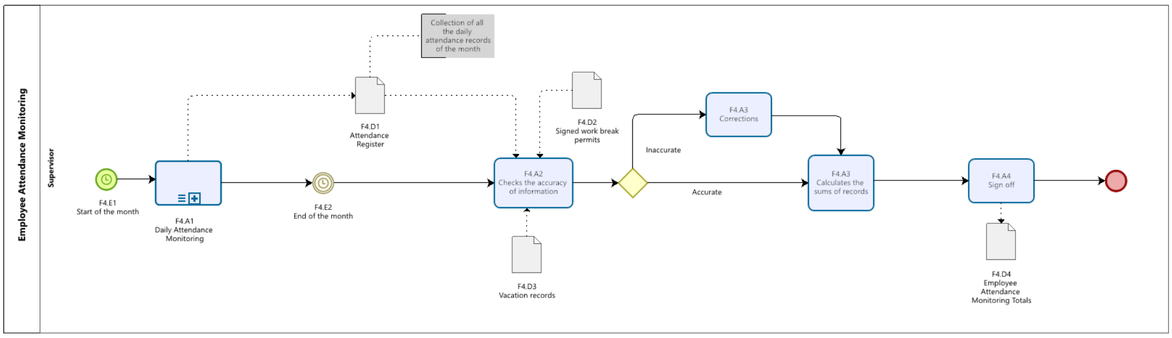


Figure 4: Monthly Employee Attendance Monitoring

The Subprocess Daily Employee Attendance Monitoring runs sequentially multiple times a month. It is modeled in Appendix 1 and also accessible in Attachment 1. The process starts when an employee arrives at the warehouse. Once they arrive, they must record their arrival time and personal information (AP1.A1) in the attendance register (AP1.D1) and the structure of the register's sheets corresponds to Figure 3. On a regular day, the employee works until the end of their shift with a break for lunch. Everyone takes the 30-minute lunch break together. Its duration is enforced by the supervisor. As a result, it is not recorded but is deducted from the total time worked at the end of the month. At the end of the shift, the employee records their time of departure (AP1.A2) and signs their attendance record in the Attendance Register. These activities create the Daily Attendance Record (AP1.D2). The Daily Attendance Record is then checked by the supervisor for inaccuracies (AP1.A9). If there are inaccuracies, the supervisor corrects them (AP1.A10). When the record is correct to the best knowledge of the supervisor, they sign off the record (AP1.A11). This creates a signed Daily Attendance Record (AP1.D2). Daily Attendance Record signed by the supervisor is a valid attendance record of that day.

In case the employee wants to take a break during the day, they must fill out a work break request permit (AP1.A4). The filled permit is then assessed by the supervisor (AP1.A5). If the request is approved, the supervisor signs the permit (AP1.A6) and the employee can proceed to record the start of their break time (AP1.A7) and leave the workplace. When they return, their return time is recorded (AP1.A8). Then they continue to work until they are finished, after which they record their time of departure, sign their attendance record and the process follows the previously described sequence. However, if they do not return (e.g. because of a family emergency, an accident), the supervisor records the start of the break as the departure time and signs the Daily Attendance Record.

In the above-described process, Vivacomex's supervisors are the process managers. They are responsible for the design of the process, monitor the status and progress of the process. They are also responsible for the performance and quality of the process. However, the supervisors are also the process's participants alongside the other employees working in warehousing operations because they also have to record their attendance and perform activities such as calculating the total of hours worked, overtime hours worked, the total work break time, and vacation time for every warehouse worker in each instance of the process.

The rest of the warehouse workers are process participants and perform the process's activities by recording every arrival and departure into an attendance register. In some cases, they also fill out work break permits and record their break time. Every employee is responsible for the accuracy and truthfulness of their records.

Table 7 summarizes the attributes of the Employee Attendance Monitoring process.

Name of the business process	Employee Attendance Monitoring
Suppliers	Warehouse workers and supervisors
Transformed inputs	Recordings of attendance, work breaks, and vacation time
Transforming inputs	The supervisors
Process	Monitoring and calculating the total worked hours, work breaks, overtime, and vacation time
Outputs	The sum of: 1) Number of hours worked 2) Number of overtime hours 3) Total work break time 4) Total vacation time
Business process specification	The output of this process is used as an input in the payroll accounting process.
Business process manager	Warehouse supervisors
Customer of the business process	Payroll accountant
Area of proposed improvement/optimization	Process performance through automatization
Metrics	Cycle time
Initiation event	Start of a month
Information system	Paper-based documentation of employee working time
Documents	Employee Attendance Monitoring Totals, Daily Attendance Records, signed work permits

Table 7: Break down of Employee Attendance Monitoring business process

4.3 Analysis of the original business process for Employee Attendance Monitoring

The main objective of the supervisors is to ensure that their subordinates satisfactorily complete their tasks with a prespecified quantity and quality of work within a working shift. Each task is assigned to a specific group or a single employee. As a result, the supervisors must know who should be working in each shift to be able to distribute tasks. That creates the need to have an employee attendance monitoring system to ensure that employees comply with the assigned working timetable.

However, the task of checking the attendance sheet and calculating the sum of worked hours, overtime, etc. for each employee is time-consuming. This time could be instead used for tasks creating value for the customers of Vivaxomex (e.g., supervising subordinates' work quality and quantity). Moreover, the supervisors cannot personally check every arrival/departure or leave/return of each employee present at the working shift. This was confirmed during unannounced visits of the CEO who repeatedly found cases of absent employees who were supposed to be working that shift and were recorded in the register as present or even working overtime. This greatly reduces the effectiveness of the process. The CEO estimates that every month 7 hours of work are recorded when the employee is not working.

An analysis of the Employee Attendance Monitoring business process has shown that it does not have information support from a computer information system. The introduction of a computer information system to support the process can increase the efficiency of the process flow and even enable automatization of processes. Such a change could improve the performance of the process by reducing its cycle time.

In this particular case, an implementation of a computer information system would be straightforward as it does not require a radical change of the current information system nor does it require a big investment.

Moreover, the output of this process is a paper document with manually calculated sums of worked hours, etc. for every single warehouseman and the corresponding paper documents. The customer of this process, the payroll accountant receives these documents and has to manually copy them into a payroll solution and also double-check the records and calculations for potential errors. Therefore, the current Employee Attendance Monitoring process does not add much value to the customer.

If the records were in a digital form, the value-added would be much greater as the payroll accountant would not have to manually copy the records.

This process was chosen for optimization because its current form is not efficient nor effective. Even though it is not a core process, its effectiveness is important for the support of Vivacomex's core processes in logistics and warehousing. Last but not least, the optimization of this process is not complex and would face little resistance from its participants.

4.4 The proposal for a new Employee Attendance Monitoring process and its realization

Based on the analysis of the discussed business process, suggestions for change are made to both the process, as well as the support system of this process. These suggestions will alter the process structure and the managers of the process.

The first proposed change is to introduce a computer information system. Its implementation will result in a structural change of the process, where different activities and their sequence will be present in the new business process. This will be discussed in further detail in the following paragraphs.

Secondly, the proposal suggests changing the managers of the process from the supervisors to the payroll accountant. Therefore, the new process manager will be the payroll accountant and the supervisors will only participate as an actor in this business process.

The introduction of computer information support is the introduction of information technologies into the business process. One of the reasons for this change is the intention of the CEO to expand the warehouses and increase the number of warehouse workers. This expansion will necessitate increased efficiency of the Employee Attendance Monitoring process, which can be achieved through automatization. A computerized attendance monitoring system, which will record the presence and absence of employees at the workplace in a digital form. This digital data will be then transformed into a required format for a payroll software application which will process this information to calculate salaries.

The attendance of employees is at the moment recorded on-site at the warehouses. These are separated from the headquarters where the payroll office is situated. Therefore, for the payroll accountant to be able to process the attendance data from the warehouses, the new devices will have to be connected to the internet. This can be provided by the existing internet connection at the warehouses and the headquarters.

The proposed changes can be implemented in the form of a project.

The following project tasks are required to implement the business process optimization.

- Define requirements for the attendance monitoring system
- Select an appropriate device and software solution for the defined requirements
- Retrieve quotes from solution vendors
- Compare and evaluate quotes
- Order and delivery of the device
- Install the clocking-in device at the warehouses
- Install an attendance monitoring software solution in a computer at the headquarters, and connect the computer to the clocking-in devices in the warehouses
- Checking the reliability of communication between IT devices of the headquarters and the warehouses
- Have a test run of the attendance monitoring system. Test the export of data from the attendance monitoring solution to the payroll accounting software solution. Investigate if there are any problems, malfunctions. Fix potential problems
- Implement the system for live use

These tasks along with their planned start date, end date, and the people responsible for the execution of these tasks are mapped in Table 8.

The selected system is TimeMoto TM-838. It was chosen based on its price and capabilities. TimeMoto TM-838 is a clocking-in device that uses face recognition. This prevents any fraudulent behavior. Moreover, it is delivered with a software solution that satisfies all the requirements for the new attendance monitoring system.

Task Name		Duration	Responsible Person
1	Defining the requirements for the new system	7 days	Payroll accountant, company management, the researcher
2	Find a suitable solution	14 days	The researcher
3	Retrieve quotes from vendors	2 days	The researcher
4	Evaluation of quotes	2 days	The researcher, company management
5	Ordering and delivery	7 days	The researcher
6	Installation of the device and software	0.5 days	Supervisors and the payroll accountant
7	Checking the data connection	0.5	Supervisors and the payroll accountant
8	Test run	1 day	The payroll accountant and the researcher
9	Implementation for live use	1 day	The payroll accountant and the researcher

Table 8: Project steps

The costs for the project of changing the employee attendance monitoring system consist of investing in the new software solution, which is included with the new clocking-in device TimeMoto TM-838 from the company Safescan. This totaled CZK 37

871 including VAT (DPH) and not including labor costs of employees who participated in the realization of this project.

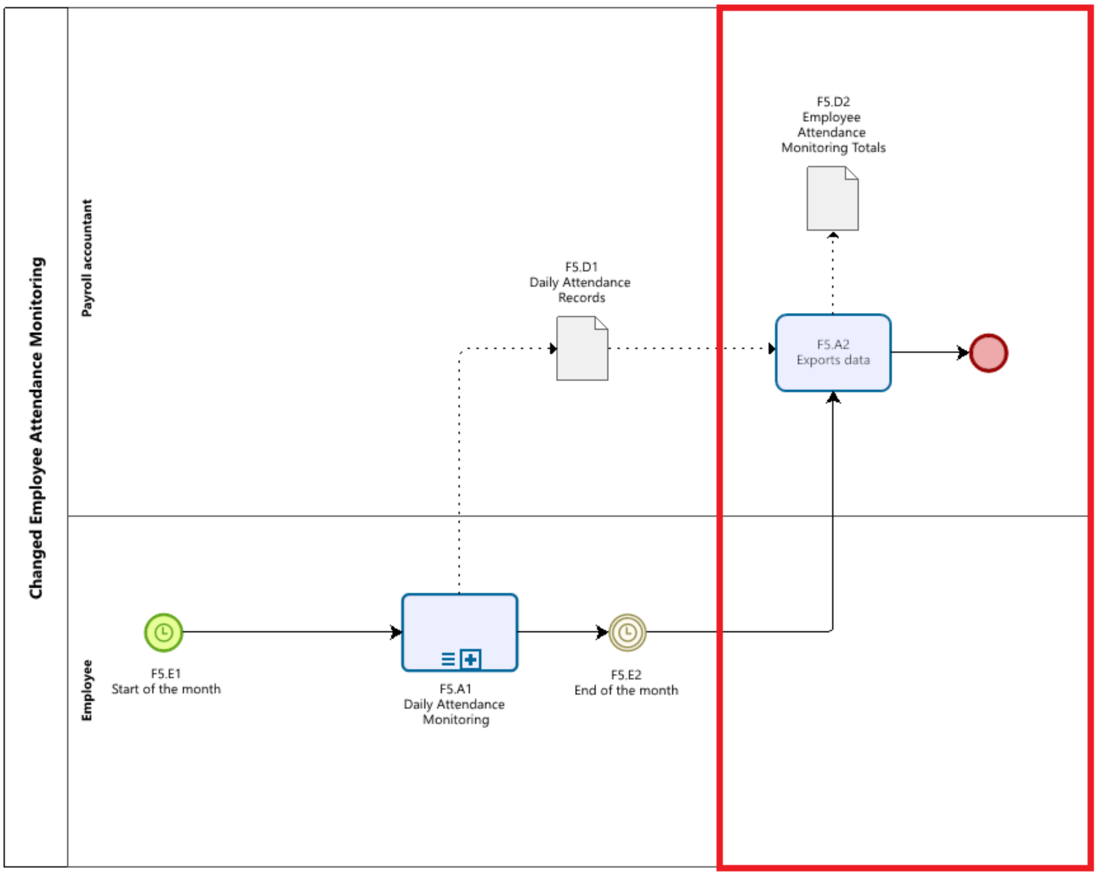


Figure 5: Changed Employee Attendance Monitoring

The proposed changes to the Employee Attendance Monitoring process are displayed in Figure 5. The payroll accountant will become the process manager and a process participant who performs activities in the changed Employee Attendance Monitoring process. Apart from the payroll accountant's new involvement, the composition of activities in the process has also changed. These changes are highlighted.

All the attendance data will be stored in the clocking-in devices and also sent to the connected computer. Using the software solution provided by the vendor, the data can be accessed on the computer, reviewed, and processed. Therefore, the payroll accountant will not have to maintain the data. The totals of worked hours, overtime, and work breaks will be calculated by the software solution and do not require any manual calculations by the payroll accountant. Even though the vacation time records will be maintained in a different process, the data are going to be in the new software solution and can be processed as a part of the Employee Attendance Monitoring Totals

(F5.A2). Because all the necessary data is in the solution, the payroll accountant will not have to manually input any information.

Therefore, in the new process the exports the attendance data into a file for importing into the payroll solution (F5.D3). The software solution has this function natively. Therefore, no extra work or activities will be needed. Moreover, the solution enables calculations in batches. As a result, all the attendance records of the employees can be processed and exported simultaneously. Once the file is exported, the process ends.

The Subprocess Daily Attendance Monitoring will also be changed. Appendix 2 is the model of the changed Subprocess Daily Employee Attendance Monitoring. The model is also in Attachment 1 as a PDF file. The following paragraphs will discuss the changes that are proposed to the Subprocess Daily Attendance Monitoring

In the first scenario, where the employee does not take a break, they arrive at the warehouse and stand in front of the clocking-in device which identifies the employee using face recognition technology. Once the device recognizes the employee it creates a record of their arrival time. This data is stored in the memory of the device and also sent to the software solution in a designated computer in the headquarters of Vivacomex. If the employee does not need to take a break to leave the warehouse, then they proceed to clock out before leaving the warehouse. The device scans their face to confirm their identity and records their departure time, stores it in its memory, and sends it to the connected computer. This creates a digital record of their attendance that is stored in the Daily Attendance Records database. That is the end of the process. The differences compared to the old process are highlighted in Figure 6.

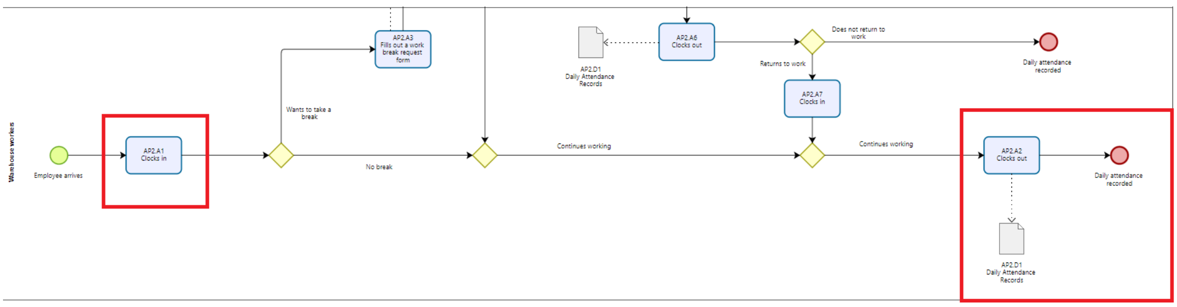


Figure 6: Differences in Daily Employee Attendance Monitoring process, first scenario

The first difference is that the employee will not self-report their arrival and departure times. They only get their faces scanned and are then automatically clocked in.

Moreover, since the device uses biometric data, the employees cannot clock in for others. Both of these changes reduce the possibilities for cheating. The second difference is that the supervisors no longer have to sign off the attendance record nor check its accuracy. The involvement of the supervisors is much reduced, saving them time that they can use for activities that add value to the external customer. They only participate in the process in cases where the warehouse employees need to leave the warehouse. Overall, this will have the effect of reducing the cycle time of the Subprocess. The reduced involvement of the supervisors is highlighted in Figure 7.

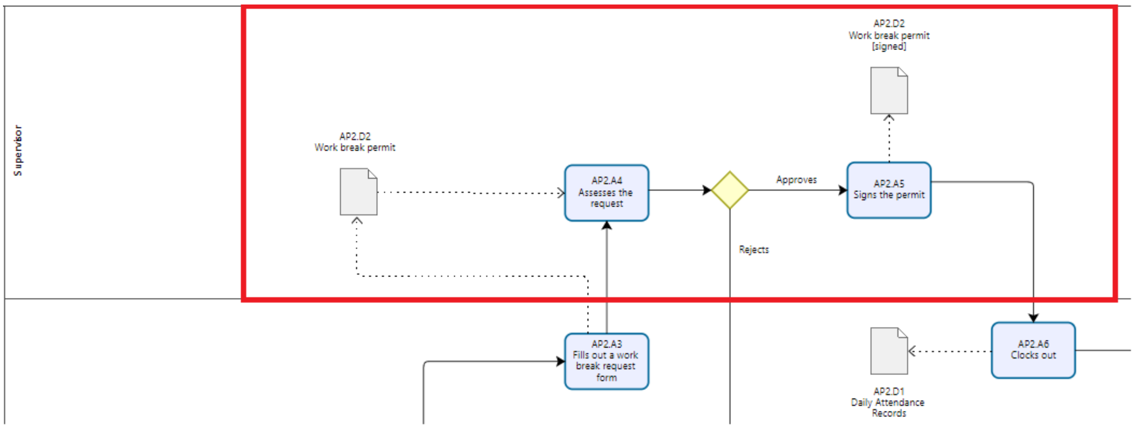


Figure 7: Changes to the supervisors' involvement

In the new process, the supervisors will only participate in the process if they are recording their own attendance or an employee needs to take a break. In case an employee wants to take a break, the supervisor will still have to assess the request, approve or decline it, and sign the work break permit, if they approve it. However, the supervisor will no longer need to check and potentially correct the attendance records. As a result, on days most days, the supervisor will only perform the recording of their own attendance and will have more time to participate in core processes.

The third difference is that in cases where the employee wants to take a break, they no longer write the start and end of the break. It is automatically recorded by the new device when they clock in or out and choose the break option on the device. Moreover, if the employee does not return from a break, their supervisor does not have to check their record and sign it off to create an attendance record of that employee for the day. The device automatically processes that and creates an attendance record into the Daily Attendance Records database. These differences are highlighted in Figure 8.

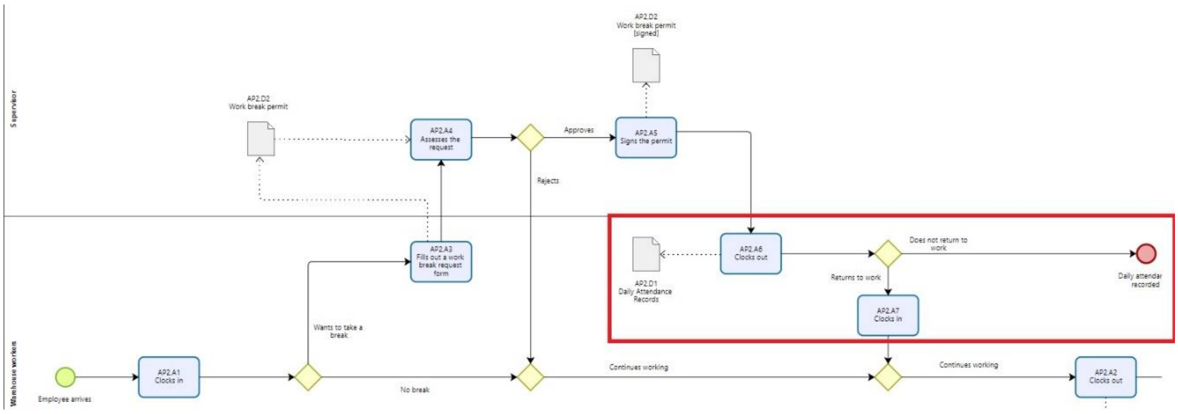


Figure 8: Third difference - when an employee wants to take a break

5 BENEFITS OF BUSINESS PROCESS OPTIMIZATION

5.1 Decrease of the cycle time of Employee Attendance Monitoring process

Partial automation of the process enables the elimination of the supervisor's role in the process. Previously they would have to spend time verifying and calculating the sum of clocked in hours of the warehouse's employees. After the optimization, the supervisors will have more time to perform warehouse tasks and responsibilities as warehouse supervisors. In particular, each warehouse supervisor would in total spend 1 to 2 hours at the end of each month checking the accuracy of the records and calculating the totals of overtime, work breaks, vacation, and worked hours for all their subordinates. These activities will no longer be the responsibility of the supervisors in the new process. The calculations will be instead automated by the clocking-in device, reducing the cycle time of the process by 10 to 15 minutes per instance. Once the file is exported, it can be processed as an output for the next process payroll accounting immediately. This is especially important since Vivacomex intends to expand its warehouse operations and hire more workers. The old process would cause a substantial increase in the total time spent doing all the manual calculations per every instance of the process. Thanks to the optimization, the performance of the process measured in cycle time will be improved.

5.2 Increase in quality

The arrival and departure records of employees will have an increased accuracy because they will be recorded by the clock-in device. The use of face recognition technology by the device ensures the correct identification of the employees. As a result, no fraudulent behavior, such as clocking in for others with a card, or dishonest overtime work recording can take place. Both of these used to be a problem at the warehouses.

The quality of the process will also greatly increase as the change eliminates the possibility of inaccurate time recording and calculation errors. After the changes, the output has a lower likelihood of defects and is more convenient as an input for the next process, payroll accounting. Therefore, the quality of the output for the process's customer has increased.

5.3 Other benefits

Last but not least, after the optimization the payroll accountant will become the process's manager. As such, they are responsible for the design, performance and monitoring, and quality of outputs. This is of great benefit to the payroll accountant because they will also be the customer of this process. Because of that, they know the desired quality and specifications of the outputs required from the Employee Attendance Monitoring process and how the performance of the process affects the quality of outputs. Therefore, they will have the ability and knowledge of the customer's needs to improve the process in the future to produce satisfactory outputs for the customer themselves.

Overall, the laboriousness, effectiveness, and cycle time will improve considerably. Thanks to the automatization of recording and calculating the data, there will be a lower likelihood of errors, increased accuracy, and lesser opportunities for fraudulent behavior.

5.4 An economic evaluation of the change

In the following paragraphs, the change to the process will be economically evaluated. NPV will be used to assess the economic benefits of the change to the process.

$$NPV = -IN + \sum_{t=1}^{n} \frac{CF_t}{(1+i)^t}$$

(Scholleová, 2017, p. 132)

The initial investment of the change consists of buying the two devices for each of the warehouses. These devices have free cloud software and free single-server PC software provided by the manufacturer. The total cost of this was CZK 37 871. The installation can be done by internal employees, therefore no additional investment costs were involved.

As mentioned earlier, the introduction of a clocking-in device will prevent fraudulent attendance recording. The management estimates this equals approximately 7 hours a month. The wages paid for these hours are also subject to health and social insurance charges, creating additional costs to the employer. The rates of charges amount to 9% and 25 % respectively. Therefore, the elimination of this deceitful behavior has resulted in increased savings and has had a positive impact on the cash flow of the company. The savings from the elimination of untruthful overtime recording are displayed in Table 9.

Since wages, health, and insurance charges are paid to the employee or authorities each month, they directly affect the cash flow of the company. As a result, these savings will be used in the NPV assessment of the investment. The rate of return has been set at 1.5% based on the interest rate of Czech government bonds (Ministerstvo Financí, 2021). The interest rate of the Czech government bonds was chosen because it is a low-risk investment and Vivacomex did not have any alternative investment opportunities.

The 2021 government bonds have a maturity time of 6 years which also corresponds with the estimated service time of the TimeMoto devices.

Savings		
		Absolute costs
Hourly rate	CZK 170	
Fraudulent hours eliminated a month	7	CZK 1190
Social insurance contribution paid by the employer	24.8%	CZK 384
Health insurance contribution paid by the employer	9%	CZK 139
Total savings a month		CZK 1592
Total savings a year		CZK 19104

Table 9: Savings from the elimination of fraudulent overtime

Year	0	1	2	3	4	5	6
Cash flow	-CZK 37,871	CZK 19,104	CZK 19,104	CZK 19,104	CZK 19,104	CZK 19,104	CZK 19,104
Discounted cash flow	-CZK 37,871	CZK 18,822	CZK 18,269	CZK 18,269	CZK 17,999	CZK 17,733	CZK 17,471
Cummulative discounted cash flow	-CZK 37,871	-CZK 19,049	-CZK 506	CZK 17,764	CZK 35,763	CZK 53,497	CZK 70,968

Table 10: Net Discounted Value of the investment

Table 10 demonstrates the NPV of the investment over 6 years. From the table, it is clear that the investment becomes beneficial in the second year of the investment. Since the seller's warranty is 3 years, it means that even if the devices break down post-warranty, Vivacomex will have already gained a return on its investment.

Conclusion

In the theoretical part of the thesis, Chapter 1 defined the basic terms in the field of business processes. Namely, it defined a business process, its components, boundaries, participants, and categories of business processes. Furthermore, the chapter also discussed the dimensions of the performance of a business process and what criteria are there for selecting a process for improvement.

Chapter 2 introduced the BPMN standard for process modeling that is used in the practical part. It discussed the types of elements in the BPMN annotation and their meaning in process models.

Chapter 3 discussed static and dynamic methods that are used for an economic analysis of investments.

The practical part of the thesis first introduced the company Vivacomex, its business, and mapped its business processes. This is followed by a description of the chosen process for optimization – Employee Attendance Monitoring. The process is analyzed and mapped using BPMN. The analysis of the process found that the process had low efficacy. It did not prevent the employees from misrecording their working time and did not effectively monitor their presence on the worksite.

The Employee Attendance Monitoring process was chosen for optimization because this process plays an important role in supporting the operation of Vivacomex's core processes and the optimization would encounter low resistance from its participants.

The proposed changes involved the implementation of clocking-in devices and the payroll accountant replaced the supervisors as the manager of the Employee Attendance Monitoring process. The devices and their software automate the attendance recording and the calculation of the total worked hours, overtime, and breaks, and vacation time. As a result, the process is greatly streamlined with fewer activities, requires less involvement from the supervisor, and digitalized parts of the process.

In Chapter 5, the benefits of the optimization were analyzed and discussed. The new version of the business process has a reduced cycle time which is one of the main measurements of a business process. Additionally, the changes to the process have reduced dishonest behavior and increased the accuracy of attendance recording. Thus, the efficacy of the process was improved.

The final part of the thesis is an economic analysis of the changes to the process. For this purpose, a dynamic method Net Present Value was used. The initial investment of CZK 37 871 was discounted using the 1.5% interest rate of Czech government bonds. The incoming cash flow is the result of salary savings that Vivacomex acquired through the elimination of fraudulent overtime hours, which was a known issue. Analysis of overtime work found that since the implementation of the change there was a 7 hours decrease of overtime hours per month. Therefore, the positive cash flow was savings on hourly overtime wages plus social and health insurance co-payments. This analysis showed that return on investment occurs already in the second year after the investment.

The research objective of this thesis is an analysis and proposal of an improvement to a business process. I believe that based on the results of the economic analysis of the change and improved performance of the process this objective was achieved.

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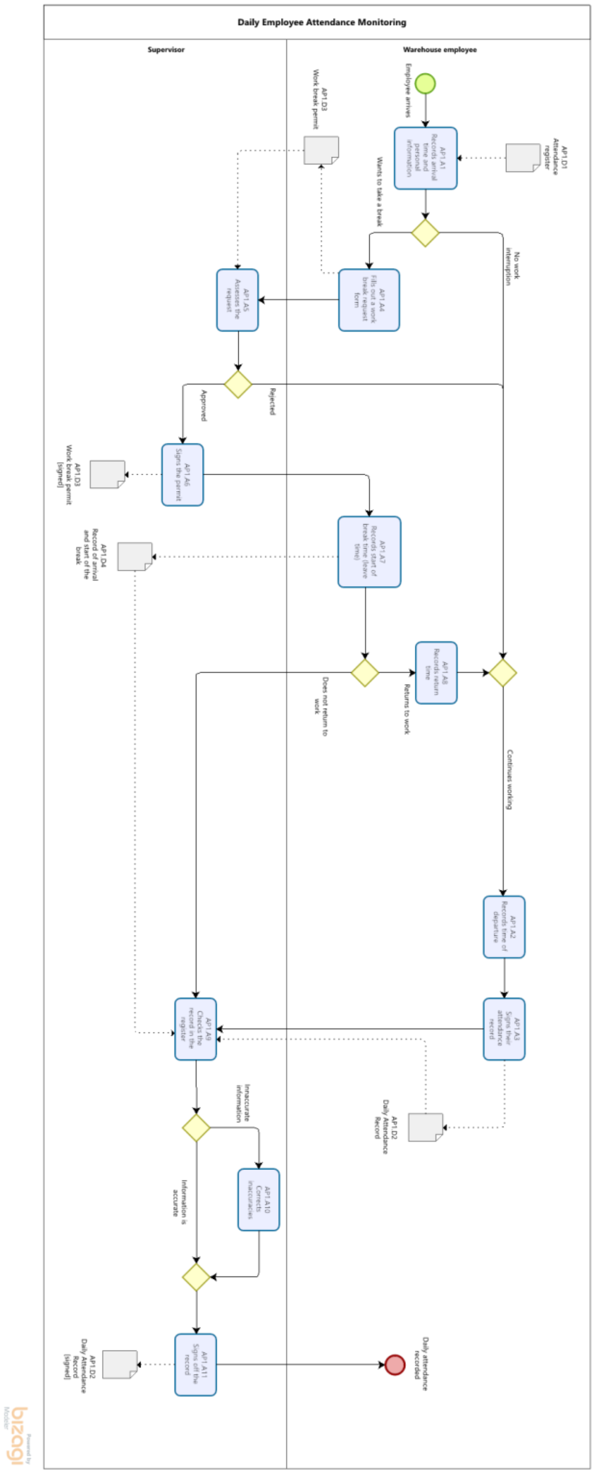
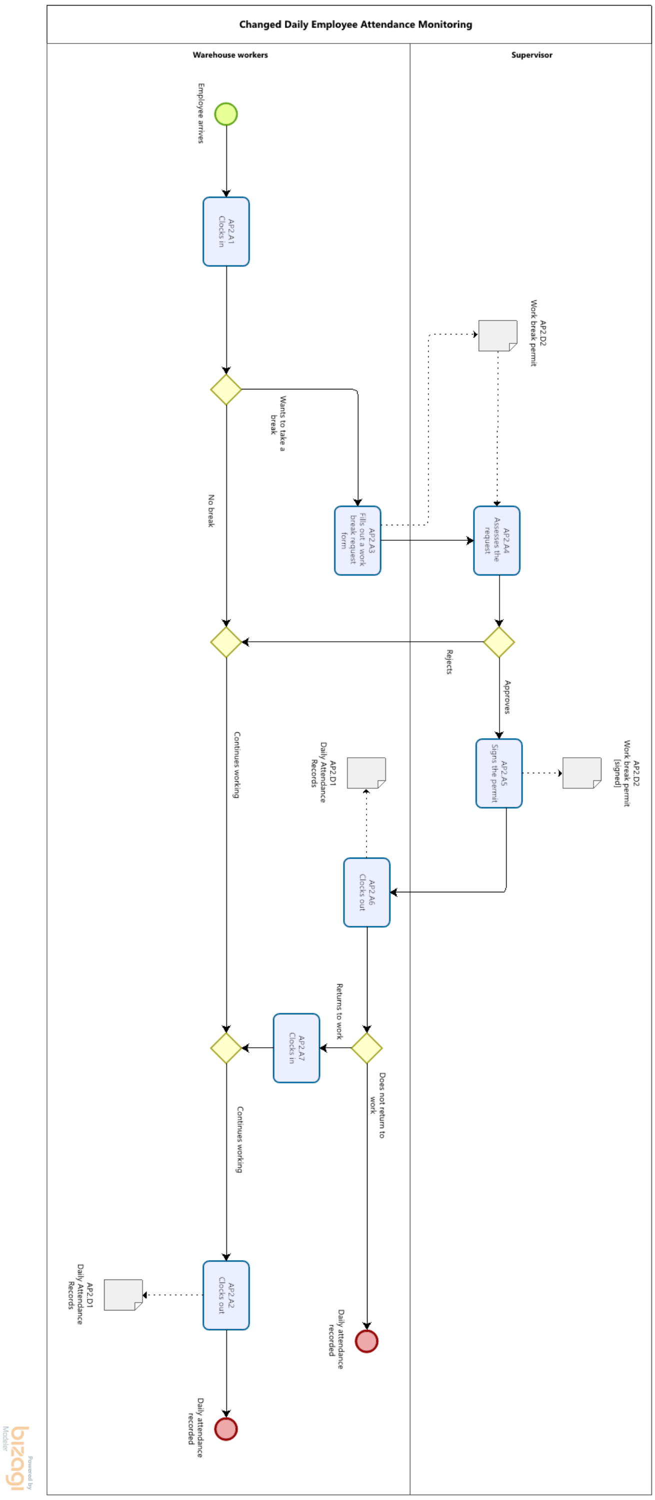
Appendix

Appendix 1: Subprocess Daily Attendance Monitoring Model



Appendix 1: Model of the original Subprocess Daily Attendance Monitoring

Appendix 2: Changed Subprocess Daily Attendance Monitoring



Appendix 2: Model of the changed Subprocess Daily Attendance Monitoring

Attachments

Attachment 1: Models of the Subprocess Daily Attendance Monitoring in PDF

Model 1: Original Subprocess Daily Attendance Monitoring.pdf

Model 2: Changed Subprocess Daily Attendance Monitoring.pdf

Evidence výpůjček

Declaration:
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