Are SMEs able to keep an eye on their corporate finances in the same way as large corporates do?

How the use of artificial intelligence can dramatically improve financial management in companies.
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Artificial intelligence
The revolution of the 21st century

We are on the brink of a revolution, and it has been in full progress for a long time already: the technology of artificial intelligence (AI) is making its way into products, workflows, and processes, and is triggering epochal changes in business and society.

The real and potential areas of application are as varied as they are exciting. Services previously provided by people – experts – can, supported by artificial intelligence, grow exponentially: driverless vehicles will revolutionise logistics and change everyone’s everyday lives. The combined expertise of doctors and technology is already able to diagnose cancer ten times better. Chatbots make customer service more efficient and are available for customers 24 hours a day.

The application options for artificial intelligence are being considered in virtually all sectors and industries. Universities and research organisations are developing principles further and devising applications. Major IT companies are also working intensively on the subject and launched their own AI solutions onto the market long ago: IBM’s AI-based computer system, Watson, recently created a stir by correctly diagnosing an illness that doctors had previously been unable to pick up on. The Watson artificial intelligence therefore saved a woman’s life.
In the spring of 2016, the Google software AlphaGo beat the world’s best player Lee Sedol from South Korea at the Asian board game Go, which is said to be more complicated than chess. And in ever more entertainment electronics, household equipment, and smartphones, speech recognition systems are being used to increase user convenience - be it Siri from Apple or the new Amazon Alexa.

They all have one thing in common: With learning machines, major progress is being made in the automation of workflows. And in the interaction of technology with human experience and the ability to evaluate, undreamed-of possibilities are opening up.

Just like the industrial revolutions of past centuries, artificial intelligence also has the potential to dramatically reduce the amount of human labour required for repetitive tasks, allowing peoples’ subject-specific expertise to be used more usefully and more productively. The fact that artificial intelligence is now on the brink of a breakthrough is due to the technological progress in the processing of large volumes of data. Two developments in recent years have now achieved a sufficient degree of maturity for their interaction to make artificial intelligence possible. One of them is cloud technology: it is no problem at all to draw almost unlimited computing power from the cloud at ever lower costs. The second is the technology of neural networks: their quality has now evolved to be excellent, thanks especially to the research work by Google, IBM, and Stanford University. Many complex situations can now be automated fully and efficiently.

Artificial intelligence is literally changing the world. Despite the tremendous progress, much still remains a pipe dream. We will probably have to wait a long time for self-driving cars, because the countless variables of road traffic remain a problem, since they all have to be taken into account in a learning process, and evaluated. In other cases, the use of artificial intelligence is already possible - and is significantly changing the way that value creation is being practised in companies and institutions.
The use of artificial intelligence can help companies significantly improve their financial processes.

AI brings **transparency** and **control** to finance.
For finance departments in companies, especially in the SME sector, there are already significant opportunities to use the key technology of artificial intelligence effectively. This is because finance has the following factors in its favour:

- Financial receipts and payment information have an organised structure
- Data sources, such as invoices and bank accounts, are easily accessible
- The data input already exists in digital form, or it can easily be digitised
- There are clear rules that must be followed in finance for the checking and verification of data
- There is no real-time requirement in the millisecond range, as is the case for driverless vehicles, for example
- (Specific to SMACC) a large control data set is available (known as ground truth data) as orientation point to train AI

How is added value being created in finance with the aid of artificial intelligence? The use of artificial intelligence can help companies to significantly improve their financial processes by making the work steps of day-to-day accounting much more efficient than previously through automation, and carrying them out daily.

The result is comprehensive transparency in terms of financials and liquidity data. With more transparency, the entrepreneur has an improved basis for decision-making, and therefore more control. And more control means better management of the company.

Artificial intelligence is used to highlight classical weaknesses in the finance department - especially of small and medium-sized businesses.
Small companies are frequently heading towards financial difficulties without realising it. Looming liquidity bottlenecks are not spotted quickly enough, because the management team does not have access to the financial data in time. According to a study by the University of Mannheim, 75 per cent of insolvencies in Germany are the result of inadequate transparency of the company’s finances: “A lack of financial controlling, funding shortfalls, and inadequate debtor management are the primary causes for companies to go bankrupt.”

Unlike large corporations with accounting, controlling, and financial planning departments, owners and managers of small and medium-sized companies are unable to keep an up-to-date eye on corporate finance, i.e. create transparency, in order to take real control. Business figures are usually available to the boss only with a delay of several days or even weeks. But why do small and medium-sized companies generally find it so hard to establish and maintain good financial management systems? Often, it is simply due to a lack of financial expertise in the company. Even more commonly, there are not enough resources to set up a finance department and use expensive software systems. And almost always, the entrepreneurial focus is not even on the supporting financial processes, but rather on core entrepreneurial processes such as product development, production, and sales. Added to this is the fact that the manual processes and paperwork are generally very error-prone. As a result, companies have only inadequate financial transparency and control. High costs in the processing of daily financial tasks and for end-of-month and end-of-year procedures must not be overlooked.

Classical problems in the finance department

Four problem areas of financial management in SMEs

Manual processing in accounting: expensive and laborious
- Employees spend up to 80% of their time as purely human/machine interfaces, i.e. to enter invoice data
- Payments are made late or discounts are unused due to excessively long processing times
- Unpaid or overdue liabilities are inadequately tracked and chased up
- Bank reconciliations and postings with high volumes of transactions are almost impossible to achieve, and prone to error

Transparency and control: inadequate insight into the business figures
- Development of the necessary current assets is hard to track or plan
- Liquidity planning is often neglected, since the current figures required for it are not available
- Company management has to cope without up-to-date figures

Physical, paper-based processes: prone to error and time-consuming
- Signatures and approvals have to be collected throughout the company, which is a laborious process
- Receipts are lost or arrive at the accounting department too late

Collaboration with tax advisers and banks: time-consuming and tedious
- The transfer of accounting data and the clarification of banking transactions and business transactions with the tax adviser are a tedious process
- Access to financial products from financial institutes is hampered due to the unavailability of figures

1 University of Mannheim, Euler Hermes Kreditversicherungs-AG: Management errors are the most common cause of insolvency. Study results can be viewed at http://www.zis.uni-mannheim.de/presse/ mitteilungen_des_zis/dokumente/2006_09_27_studie_pressemitteilung/pm_eh_studie_insolvenzgruende_06_09_27.pdf [last: 30.01.2017]
Functioning of an artificial neural network in a finance department

Monitored and unmonitored learning are explained below and their use is illustrated using the example of a billing address.
To understand how the technology of artificial intelligence works, it is worth taking a look at how machine learning works. Machine learning is the umbrella term used for the artificial generation of knowledge from experience. In other words, a man-made system uses examples to learn from, and is able to universalise these after the learning phase ends. So not only does it learn the examples by heart, it also recognises patterns and regularity in the learning data. As a result, the system is also able to assess unknown data.

Artificial neural networks (ANN) facilitate a highly effective type of machine learning. These are based on the networking of many artificially generated (mathematical) neurons. This is derived from the way that the human brain works. From a practical perspective, an ANN "learns" by dynamically adjusting the weighting of the many artificial neurons in the network within a mathematical function. The topology of a network, i.e. the structure of a mathematical model for a learning task, must be developed according to the task itself and the data available. The quality and volume of the data plays a key role in this. This ground truth data, a concept taken from cartography, represents validated data which the model uses as orientation. Once the ANN has been built, the training phase follows in which the system "learns", i.e. the model is optimised. Because of the complexity in networking the many artificial neurons, this process is extremely computing intensive & requires modern, powerful computers. During this training, a distinction is made between supervised & unsupervised learning.

**Supervised learning**

The term "supervised learning" refers to the ability to map regularities. The results are known through (natural) laws or expert knowledge and are used to teach the system. From associated inputs and outputs, the algorithm learns a function. During the learning process, a teacher provides the correct functional value for an input. The aim of supervised learning is to enable the neural network to create associations after multiple calculation runs using different input & output pairs.

Supervised learning constitutes human/machine collaboration having the characteristics of an expert system. The neural network learns from people. It identifies the relationships between the individual elements and how the expert, e.g. an accountant, handles them.

**Unsupervised learning**

With unsupervised learning, no target values are known in advance. Therefore no teacher is needed to provide supplementary classifications. Artificial intelligence independently looks for patterns in the entered data. It recognises patterns where the data deviates from unstructured noise. An artificial neural network is based on the similarity of the input values and adapts the weightings accordingly.

With the technology of unsupervised learning, problems such as image recognition, for example, can be resolved. Often, automatic segmentation of data (clustering) is desirable for this.
All of the elements of an invoice exist in a finite, recurring relationship with each other. Humans grasp this relationship and are therefore able to correctly interpret the meaning of individual numbers. Artificial intelligence uses input from experts, for example a financial accountant, to learn the relationships between the individual elements of an invoice. It later applies this knowledge automatically to new invoices.

Experts then no longer need to get involved. ANN has not only learned existing information by heart, but it is also able to apply its knowledge to new, unfamiliar invoices and receipts. Ultimately, artificial intelligence automatically extracts hundreds of pieces of information from an invoice.

The starting point might initially seem trivial, but is actually the quite complex task of automatically recognising and understanding an address in a document. The ANN uses optical character recognition (OCR) software and draws the following conclusion:

The number 14482 appears on the invoice. What does that number mean?

A word is added to the number: 14482 Potsdam
So the word provides the context: with 70 per cent probability, this is a post code.

In the line above is: Rudolf-Breitscheid-Straße
The address helps to verify with 98% probability that this is a post code.

A look at the surrounding context shows that the address is located below the sender’s line. It is now confirmed with 99% probability that it is the recipient’s post code.
In finance, for small & medium-sized businesses, there are three areas of application for artificial intelligence:

- Automatic reading of receipts
- Autonomous account allocation and processing in day-to-day accounting
- Independent reconciliation and processing of account movements and receipts

How artificial intelligence is creating added value for the finance department today
Three areas of application in the finance department

Automatically reading and interpreting data from documents

Invoices and receipts contain a large amount of data, such as invoice items and payment conditions. The system uses many thousands of inputs from experts to learn to recognise & validate the relevant data independently. Manual inputs are fully superseded. The digital, paperless processes save costs and boost efficiency.

Autonomous allocation

In the next step, the information generated is checked and allocated to accounts by experts such as accountants and tax advisers. Based on countless inputs from experts, the system also learns to predict the account allocation process with high probability and independently makes proposals for posting records, on the basis of invoice items. Information, once acquired within the software, is constantly reused by artificial intelligence. Every input from experts, for example tax advisers, is made available in the system and used to improve the over-arching model.

Automatic reconciliation of account movements and invoices

The reconciliation of account data and receipts as well as the allocation of banking information can be carried out very quickly and reliably using artificial intelligence. The software accesses both sources of data directly. Self-teaching algorithms compare the document information with the movements in the company’s bank accounts. This makes the bank reconciliation process much more reliable, and most importantly it can be carried out on an up-to-the-minute basis at any time. The processes become more transparent and reliable. Evaluations such as up-to-the-minute liquidity statuses become possible.
However, the possible uses of artificial intelligence in a finance department go way beyond the creation of up-to-the-minute financial reports and the automation of accounting. For the allocation of receipts and compliant accounting, it must be ensured that receipts meet the legal requirements and that business transactions can be verified correctly for taxation purposes. However, a company needs significantly more information to run a good finance department. Information such as payment conditions, bank details, the assignment of cost centres and cost units, approval processes for invoices or customer and supplier contacts are essential for handling financial processes successfully. With the aid of artificial intelligence, it is possible to collect hundreds of pieces of information for the finance department from receipts and payment transactions, and to process this information automatically. This means that the widespread automation of finance is already a reality, allowing the simple and up-to-the-minute processing of payment transactions, the management of outstanding receivables, or also liquidity planning.

Creating a basis for business development forecasts

Using artificial intelligence, a company’s current financial situation can today be portrayed with accuracy. In future, the expert system of supervised learning will be replaced with partially supervised and even unsupervised learning. Behind this is the vision of being able to predict how a company will develop.

For unsupervised learning, information sources are used that do not come from the closed system of the finance department - for example, macro-economic developments, weather information, events and anything else that could potentially affect a business’s future development. Fully independently and without direction, the system searches these information sources for patterns, and creates forecasts of the company’s future development.

The integration of high numbers of data sources into the system creates greater financial security for companies, reduces business-endangering risks dramatically, and taps into positive development potential.
How much artificial intelligence does SMACC offer?

The various applications of AI technology, united in a single solution for all the key financial processes: That is SMACC. Companies gain more transparency and control. Already. In future, SMACC will also go for unsupervised learning, and thus give companies even greater control thanks to forecasts.
Solutions for the four problem areas thanks to SMACC

**Today**

- Manual processing in accounting: expensive and laborious
- Physical, paper-based processes: prone to error and time-consuming
- Transparency and control: inadequate insight into the business figures
- Collaboration with tax advisers and banks: time-consuming and tedious

**Using SMACC**

- Transfer of receipt data and allocations are completed automatically. Manual inputs are fully superseded.
- By digitising invoices and receipts as well as the paperless processes that follow, costs are saved and efficiency boosted.
- Up-to-the-minute reports give companies an accurate insight into their business figures, and therefore true transparency and control.
- The time spent on going through business transactions with the tax adviser is minimised.
- Transparent business figures provide easier access to financial products from financial institutions.

How easily your receipt gets to SMACC

Scan the invoice with the SMACC scanner, forward the mail attachment or send it as a photo: it is digitised and allocated automatically.
Debtor and creditor accounting is a complex affair for Sanubi due to the different payment modalities and the involvement of health insurance funds. SMACC's technology has brought about dramatic improvement, which brings us transparency on a daily basis and saves thousands of hours of work.

Cristina Koehn, CFO Sanubi
SMACC customer since May 2016
SMACC offers innovative software and services that use the methods of artificial intelligence, such as machine learning, to automate financial processes in companies, and to provide enterprises real-time transparency as well as forecasts of their future financial developments. SMACC customers are already achieving a degree of automation of 80 per cent in their day-to-day accounting practices and associated financial processes - and this percentage is rising.

SMACC GmbH was founded in 2015 by Dr Ulrich Erxleben, Janosch Novak and Stefan Korsch in Potsdam. The company employs over 50 people and looks after hundreds of companies with 1 to 1,000 employees. In June 2016, SMACC concluded a series A financing round for 3.5 million euros.

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Despite growing digitisation in all areas of life and work, the volume of paper invoices and receipts continues to be very high. Even digital receipts, such as PDFs, have to be fed into the accounting system. Software systems and machines will in future be increasingly more intelligent and help people to make intelligent decisions. With accounting software, which has become smart through highly complex technologies such as artificial intelligence and machine learning, company owners from the SME sector can also keep the same eye on their corporate finances that they would if they were a director of a DAX-listed company. In other words, all the information they need about their company’s finances, always up-to-date and whenever they need it.

The time is right. In many industries, intelligent machines are already becoming reality. Driverless vehicles are taking their first test drives. With medical human/machine combinations, successes in cancer screening are growing exponentially. Facial recognition, semantics, play - and even finance: the technologies of artificial intelligence are demonstrating their market maturity in a wealth of very different contexts.

Small and medium-sized companies can now automate their finance processes and, with the aid of SMACC and artificial intelligence, make sound business decisions based on a new, valid overview of their day-to-day finances. More streamlined and efficient accounting makes it easier for them to develop their business. Not only that, but access to financial products also improves, safeguarding jobs in the company.

For the future, SMACC has also pledged to provide its customers with AI-assisted forecasts of their business development in order to spur on their business. To do this, SMACC is investing in the research and development of its AI-based processes.

Author: Uli Erxleben, Co-Founder and Managing Director of SMACC.
Potsdam, 30 January 2017

From left: The founders of SMACC: Stefan Korsch, Uli Erxleben & Janosch Novak