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A critical assessment of the business value impact of digital transformation among the Purchase-to-Pay process of multinational companies using digital exponential technologies in addition to core technologies

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Abstract

Digital transformation and the use of exponential technologies is a very popular and highly discussed topic for companies in the digital age. The question arises whether and which business value impacts arise through the introduction of new digital technologies. This work project addresses these questions along the main end-to-end process Purchase-to-Pay by initially identifying the process and its challenges for multinational companies. This is followed by an outline of the challenges of digital transformation along the P2P process and finally a more detailed evaluation of exponential technologies. These topics have been intensively discussed and elaborated with experts from different backgrounds. As a conclusion, only a small selection of available exponential technologies is being used and can show a positive impact on the company.

Keywords: Purchase-to-Pay, Digital Transformation, Exponential Technologies, Business value impact

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1 Introduction

The digital transformation supported by modern technologies is a trendy and highly discussed topic in today's digital age. Many companies face a rapidly growing number of challenges and faster disruptive developments in international markets. Due to globalization, the political and social increase in global trade and easier access to international markets, companies have to face many competitors and changes in customer requirements in the market. Global value chains' resulting environment often proves to be complex, with strong dependencies, and intensive internal and external factors of influence, that can be particularly dynamic, disruptive and often inevitable. Such disruptions in the global economy, in the various branches of industry, within the value chain and within the individual company increases business processes complexity, especially of multinational companies. Due to the increasing complexity of business processes and the competition-based pressure of the strongly changing customer market, many companies are forced to enter into different forms of business networks to generate competitive advantages. These networks increase the number of influencing factors on a company's value-added process, which can be recognized especially through increased legal, logistical and purchasing policy standards in purchasing processes. (Ahuja & Ngai, 2019) The quick market changes and disruptive business processes mentioned above are especially intensified by the easier access to the rapidly growing communication and information sources by means of digital technologies. Not only has the number of digital technologies on offer grown exponentially over the last two decades, but also their significance and role within business practices and the products and services that have emerged from them on the global market. In order to maintain their competitiveness, many companies today are forced to deal with the digital transformation and the use of digital technologies and to evaluate and exploit the development potential of these technologies. (Expert 5)

This thesis aims to contribute to a better understanding of the challenges faced by multinational companies along the purchase-to-pay process and its digital transformation as well as to provide an evaluation of the very popular exponential technologies, their possible applications and their impact on business value.

2 Literature Review

The market of digital innovations has grown a lot in the last few years and a lot of new technologies have emerged that are already highly publicized and marketed, however, the actual deployment methods, the requirements for implementation and their actual business value impact is not yet very clear for many companies. This direct research paper is a comprehensive analysis on the actual business value impacts of exponential technologies on the purchase-to-pay process. In order to analyze the business value influences in more detail, the first part of this research focuses especially on the presentation and analysis of the individual technical terms of business value impacts, purchase-to-pay, digital transformation, and exponential technologies. This will help to understand the status quo of the companies and the technologies in the market, which will enable a better evaluation of the influences. Furthermore, different possible applications of these technologies are shown in order to be able to analyze the influences on the operational purchasing process.

In order to get a basic understanding of the elementary terms and their far-reaching scope, the most important elements are briefly explained in this section.

2.1 Business Value Impact

The business value impact can be viewed and defined from different perspectives. The term business value impact is an extensive and multifaceted phenomenon which consists of several dimensions and must be considered. Although the first thing that comes into mind is probably the financial aspects of a company's investment, which in any case is one of many basic factors for the company's existence and long-term growth, but it does not guarantee the sustainable

growth and survival of a company. For this reason, there are other factors that have become increasingly important over the last few years and are seen as important impacts of the business value. A company takes a responsible position in society and a business environment in which it must take into account the needs, interests and expectations of all its stakeholders and the resources used by the company. In general, it can be seen that corporate stakeholders have a significant influence on business and demand more information and accountability to rebuild and strengthen the declining trust in various business processes of companies. (Edelmann, 2020) Through more open and comprehensive communication the reputation of the company can be strengthened, which has a decisive influence on the sustainable development of the company. The reputation risk is seen by the managing directors as one of the biggest challenges for companies in a world with more transparency. Companies cannot afford to engage in unethical business practices, as they can reach the public much more quickly in the digital age and thus cause extreme damage to the company's reputation, which can jeopardize its existence. (Veihmeyer, 2017)

Thus, at least the social and ecological influencing factors can be added to the economic factor. These factors regularly influence the decision-making processes of companies and interact very strongly with each other. (Junge & Straube, 2020)

The main tasks of a company are to find a balance between the demands of the various interest groups and to maintain the sustainability of business practices. This view requires a holistic approach, which is the key to long-term and sustainable business success.

2.2 Multinational companies and P2P process

A multinational corporation is a company that engages in business outside its home country and receives a portion of its total sales outside its domestic market. Typically, this company has locations, offices or other assets in countries other than the domestic country where the central corporate management is headquartered, in order to conduct business practices in different

countries. They are often seen as the driving force behind globalization, as they have spread and offered their products, services and know-how beyond the borders of the home country. (Chen, 2020) This global orientation in particular has enabled the establishment of numerous new companies with new business models and value creation strategies, which require an efficient coordination of corporate divisions such as sales, purchasing, production, logistics and administration and their process participants.

The importance of purchasing and the very strongly linked P2P processes cannot be generalized, as it is very much dependent on the industry, the business area, the own business model, the value-adding partners and the resulting purchasing volume. In general, however, it can be stated that purchasing is a critical factor for value creation and a very important partner for strategic decision-making processes, which means that an improvement of the associated processes should be highly favored. The main processes like sourcing or the P2P process contribute inevitably to the company's strategic orientation, it's financial performance and value creation processes. (Bag et al, 2020)

To be able to analyze and evaluate the effects, impacts and changes of digital transformation along the P2P process, it is important to distinguish this particular process from the other business processes, to outline the components and to point out its main challenges.

The Purchase-to-Pay process is one of the most important core processes of a company without which no resources would be available for operational activities.

In the context of this scientific work, we try to focus only on the P2P process and not to go into the upstream sourcing processes even more. As we will see in the following, a strict delimitation of the processes in digital transformation with the use of linked and fully integrated systems is not so simple, since many business value impacts of the technologies of the P2P process can also have an effect on related processes.

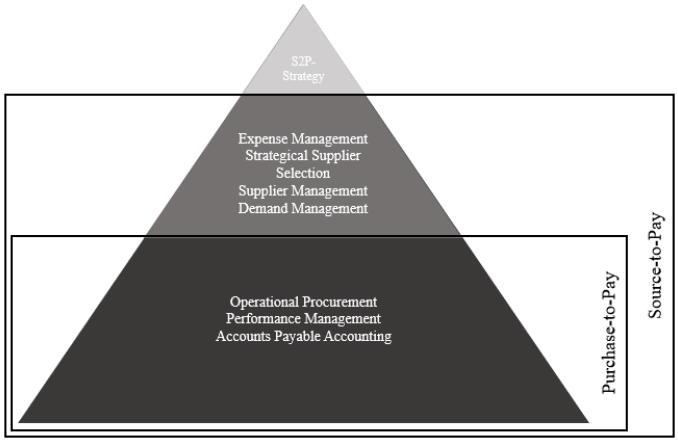

Figure 1: Source-to-Pay (Seeburger, 2017)

As can be seen in the figure one above, the procurement process can generally be divided into two main processes: 1. sourcing and 2. purchase-to-pay, thus forming the overall process "source-to-pay".

In general, the Purchase-to-Pay process is understood as an operative procurement process, which can be divided into the following superior areas of activities:

1. Operational procurement,
2. Performance management and
3. Accounts payable.

These three main areas of the P2P-process consist of primary processes and secondary processes and are in continuous exchange with internal and external process stakeholders. Through their activities, the primary processes have a direct influence on the control of the procurement process and require action to run the P2P-process.

The secondary processes, also called support and/or auxiliary processes, have an indirect influence on the P2P process and are there to support and ensure the correct execution of the primary processes. (Seeburger, 2017)

The primary main processes can be assigned a total of 6 core activities, which launch the P2P process with the initial purchase request. This purchase requisition usually includes the type

and characteristics of the service required and the quantity of this service. This process step is usually followed by the creation of a quotation on the basis of the purchase requisition. This estimate is provided by the supplier and includes all the necessary technical and commercial details of the supply of goods and services. After a thorough examination and the final agreement of the terms of the contract the responsible person for purchase sends a purchase order to the supplier, in order to initialize a legally binding purchase process and the further exchange of goods. The exchange of goods by the supplier is fulfilled in the next process step by the delivery of the requested supplies. After the successful fulfillment of the previously defined service request, the invoice is generated and forwarded to the accounts payable department. This supplier invoice is followed by the final payment process, which is executed by the treasury manager and thereby concludes the purchase-to-pay process.

As can be seen in the reality of ordering processes, these primary main processes do not always run correctly, so that so-called secondary auxiliary processes are necessary to support the P2P process. These secondary auxiliary processes vary from company to company. One of these secondary processes is compliance management, which ensures observance of predefined rules and processes within the company as well as legal requirements, especially with regard to authorizations and the release of individual process steps. In addition, there are important accounting deviation analyses, which examine the purchase order, delivery order and final invoice to document and report errors directly. Additionally, there are so-called delay notifications to inform the supplier about the violation of the agreement if he does not comply with the agreed delivery terms. (Rosar, 2017) This is a very important step to identify and solve possible resource bottlenecks for the further value creation of products at an early stage. Furthermore, with the increasing amount of supplier information and a growing supplier base, the maintenance process of supplier master data has become an essential process for multinational companies. Changes in the necessary information such as bank details or the

relocation of business locations must be continuously administered in order to ensure an error-free process flow.

The primary and secondary process steps along the end-to-end process of Purchase-to-Pay, as shown here, provide an important insight into the process flow and the cross-entity networking of the individual process participants along the procurement process of companies.

2.3 Digital Transformation and exponential technologies

Digital transformation is not only the change from analog to digital (=digitization) or the use of digitized information to make the work steps easier and more efficient (=digitization), it actually goes one step further in changing the way business is done. Digital transformation can be defined as a holistic change process in which digital technologies are used across the board to create new business processes, a new corporate culture, new supplier and customer experiences or to modify existing ones to meet changing business and market requirements. (Salesforce, 2020) The maturity of the digital transformation process can be determined by different perspectives. One of these views is the degree to which a product, service or business model accesses analog or digital methods. Another looks at the degree to which a product is digitally connected to its environment and the communication with the process stakeholder. In addition, there are views of the degree to which processes have been adapted to digital possibilities and the degree to which new business models are being adopted that can only be implemented using digital means and were previously impossible. The progress or the degree of digital transformation of a company can be viewed individually or as a combination of the different perspectives. (Keese, 2016)

The introduction of various core technologies such as transactional ERP systems was the beginning of many companies transforming their processes digitally. Over the last few years, the range of digital technologies and their capabilities has expanded greatly, resulting in the

emergence of so-called exponential technologies, also known as "advanced new digital technologies" or "emerging new technologies". (Hopkins et al, 2020)

The Moore's Law describes the phenomenon behind the definition of exponential technologies, which states that the doubling of computer chips and the resulting processing power of a computing system every two years is equivalent to an exponential increase. (Robison, 2012)

These technological innovations have a very fast speed and a very fast growth which allows disruptive and revolutionary features to be achieved.

Exponential technologies go beyond the classical core technologies and usually form very complex and continuously evolving digital constructs that increase exponentially in performance. (Ismail, 2015)

Four exponential technologies were selected for closer analysis in order to present their functionalities in more detail and to be able to analyze their practical application possibilities and the resulting business value impact in the subsequent assessment.

2.3.1 Cloud Computing

Cloud Computing is one of the most sought-after exponential technologies of the last 10 years and could be used not only by multinational companies due to its variable provision of exponentially growing storage capacities and network capabilities through the strongly growing volume of data stocks, but also by smaller companies or even private individuals. (Techopedia, 2015) The cloud technology has five characteristics and four different deployment methods, which have certain advantages and disadvantages. The cloud is characterized by the need for network access, by sharing a common pool of IT resources, by elastic scalability of the usage volume, by measurability and billability of the actual usage volume consumed and by the provision of ready-to-use infrastructures. In this context, four main application options have developed, which are provided by most cloud providers and which enable flexible use of the cloud according to need. These four deployment options are Infrastructure as a Service (IaaS),

Platform as a Service (PaaS), Software as a Service (SaaS) and Business Process as a Service (BPaaS). (Columbus, 2018)

2.3.2 Advanced Analytics

Every day a company is flooded with a variety, high volume and increasing speed of data, which is called Big Data. (Gantz, Reinsel, & Rydning, 2018) Up until now not even 10% of this data volume has been used, although this data has an enormous value potential. (Gantz, 2013) The Advanced Analytics technology occurs in 3 ways, which have the goal of detailed insights, improved problem comprehension and countless possibilities to predict - and even shape - the future. One of these types is the descriptive & diagnostic type, which is currently the most widely used by companies. This type of analytics includes the description and evaluation of current and known data, which is mostly demonstrated by dashboards or business intelligence systems. A multinational company is thus able to monitor the individual processes of the operative ordering procedure, to point out critical factors of an order such as meeting deadlines or the deviation of ordered and delivered quantities as well as to identify optimization potentials through the detailed analysis of transaction data and the automatically generated metadata. In addition, a company can analyze its cost structures in detail and outsource non-value-adding processes to a business partner to save costs. (Schuh et al, 2020)

Another form of this technology is the predictive analysis, which attempts to make predictions about an unknown future state through statistical analysis of existing data. The prescriptive nature of advanced analytics uses advanced algorithms and feedback loops to evaluate multiple options and generates recommendations for decisions based on the probability of each outcome. To perform these analyses, consistent data quality, sophisticated algorithms and machine learning programs are required. (Moreno, Cavazotte, & Souza Carvalho, 2020)

2.3.3 Artificial intelligence

Artificial intelligence is one of the most popular collective terms in computer science today and many companies are striving to use these technologies to imitate the functions of the human mind such as learning or problem solving. Together with the advancements in data collection and storage, the data analysis is of central importance for the success of AI technology. One of AI's basic systems is Robotic Process Automation, which allows for the targeted use of standardized business processes through their continuously consistent data sets by defining process steps and conditions for automatic execution. Along the P2P process, RPAs are used especially in accounting and payment processing, as there are many standard processes such as clearing open items or creating payment instructions. (Dwivedi et al, 2019) A more advanced variant of AI is Machine Learning, which mimics human learning by independently accessing and using data to achieve a defined end goal. Machine Learning, through its statistical and mathematical calculation methods along the P2P process, is mainly used in the translation of documents, in the processing of audio and visual data for conversion into system-compatible formats, in the coordination of interdepartmental problems such as the reconciliation of requisitions, purchase orders, stock receipts and supplier invoice items, as well as in the variance analysis of supplier contracts and the actual delivery terms observed. (Dwivedi et al, 2019) Finally, there is the much more extensive but not yet very widespread artificial intelligence in the corporate environment, which does not require clear objectives or defined framework conditions and can execute decisions based on statistical calculations and pattern analysis itself without the need for human interaction. Previous applications of AI can be found in chatbots for round-the-clock information exchange with international suppliers or in the voice control of a few systems. (Gualtieri, Giudice, & Purcell, 2018) As can be identified by the above-mentioned application possibilities, the individual systems of Artificial Intelligence can create a special added value in the automation of standardized

processes, the acceleration of business processes and the deviation analysis of plan, target and actual data.

2.3.4 Blockchain

Blockchain technology is a very controversial technology, which has become properly known especially in the financial field due to the rise of the Bitcoin cryptocurrency. The immediate and constantly updated exchange of data between users, which consists of an ordered set of linked and replicated data blocks, the architecturally structured configuration of the blockchain into a distributed and shared database, and a decentralized immutable consensus mechanism secured by cryptographic algorithms are just some of the features that make this technology an instrument of inclusive data exchange. (Frizzo-Barker et al, 2020)

Due to its technological characteristics, a kind of database with continuous and non-corruptible recording of transactions, blockchain technology has developed into a fully integrated and transparent network, which opens up many opportunities for application in value-added processes. (Niu et al, 2021) Although blockchain technology and cryptocurrencies in general have received considerable attention in recent years, the technology has not yet made it beyond the feasibility and prototype phase for many companies to present an applicable solution. As this is a very integrative technology, the willingness of a company's stakeholders to use it must be there in order to make it work for all participating companies. Full integration still faces a number of cultural, regulatory, legal and logistical issues that need to be resolved to pave the way for greater adoption of the technology. (Hughes, 2019)

3 Methodology

Since this research is a critical analysis of the actual realizable business value impacts of exponential technologies, this work is mainly based on reference projects from the field, research reports from practice-oriented and independent institutions, and interviews with experts from the various disciplines and positions from the field. In order to be able to

conduct a realistic analysis and validation of the evaluation, a qualitative approach in combination with interviews was chosen as the methodological approach. In order to establish a firm basis for the evaluation of digital technologies, an intensive literature review of the individual technical terms was first conducted. This review was performed through academic literature from databases such as ScienceDirect and Harvard Business Review, publications from renowned research institutes such as "Forrester" as well as through publications of practical research papers from independent consulting companies. In order to be able to consider the latest innovations and applications of the rapidly developing market for the research work, data sheets and publications of technology providers were also taken into account. Through the knowledge gained from the analysis of this information, many positive and negative business value impacts of exponential technologies were identified, which could subsequently be validated through interviews with experts with long-term professional experience. To guarantee a cross-validation, three experts from the technology provider and consulting side as well as three experts from the user side were explicitly selected.

4 Digital transformation potential impact on P2P process

In the following, we will now move on to the analysis of the effects on this main process through the use of exponential technologies. Since a large number of such disruptive technologies have been developed in recent years, this thesis focuses on the four most well-known and promising exponential technologies. (Briggs et al, 2020)

4.1 Business challenges along the P2P Process

As can be seen from the explanations above, multinational companies in particular face many challenges along the execution of the P2P process. Multinational companies not only have to consider national factors, but also have to face global influences and more complex commercial law factors. Especially the purchasing, accounting and sales departments have to face these challenges as they have the most contact to external process participants.

One of the biggest administrative challenges is the coordination of the extensive internal and external process stakeholders along the operational purchasing process. The trend towards outsourcing of various process steps to external companies as well as the relocation of internal company departments abroad has greatly increased the challenge and also the pressure to efficiently coordinate value-added partners. The pressure for the smooth running of the P2P process is not only due to the externalization of value-added processes, but also to the shortening of the product lifecycle, which has resulted over the last two decades from social change and requires a faster handling of the value-added process of products. Friction points, which represent inefficiencies of this value-added process, must be continuously eliminated and reduced to a minimum in order to meet growing customer requirements. A multinational company with global locations also has to deal with special country-specific legal challenges such as compliance with country-specific accounting standards, compliance with transfer pricing documentation guidelines and the sometimes very complex customs clearance guidelines. (Massoner & Pressleitner, 2020) Depending on the corporate structure and the location of the parent and subsidiary companies in the respective countries, these legal challenges can vary and differ greatly.

In addition, companies are faced with strategic challenges, which are particularly evident in the selection of company locations, purchasing policy orientation and the selection of business partners.

Especially for manufacturing companies with high resource requirements it is important to choose a location that has good connections to suppliers in order to reduce risks in material supply and inefficient communication with business partners. By outsourcing specific value-added processes to these business partners, an efficient exchange of information and successful trust management is essential for a secure and smooth value-added and procurement process. (Gutierrez et al, 2020)

Logistical challenges represent another part of the impacting factors of the operative purchasing process. The additional coordination effort involved in exchanging goods abroad due to the need for numerous logistical documentations, the more extensive handling of the different formats of the respective documents, the more complex calculation of order quantities due to the comparison of warehousing and quantity saving potentials, the increased security measures at the individual locations for the compliance with company-wide quality requirements when sourcing from local suppliers and the language barriers due to the different national languages at the individual locations of multinational companies are only a few logistical challenges that influence the P2P process. (Expert 6)

The purchasing policy challenges of a company with locations worldwide are especially the reduction of transaction costs, ensuring control functions in decision-making processes through compliance regulations, the increased complexity in the coordination of goods requirements, goods consumption and procurement and the resulting more efficient capital commitment, as well as the elimination of delays in the procurement and provision of materials or services. In addition, enterprises try to reach a strong reduction of so-called Maverick Buying's, which usually by reactive spontaneous purchases without the agreement of the procurement department, by small confidence in officially certified suppliers of the procurement department or by ignorance of the coworkers over existing procurement processes and basic agreements with suppliers. (Wannenwetsch, 2013)

An organization's financial challenges may include optimizing working capital management and improving cash flow management to reduce high capital commitment and risks due to high inventory levels, additional expenses due to late payment of liabilities, and poorer credit terms due to poor DPO rates. In addition, a company tries to identify new optimization potentials by analyzing the company costs and investments in order to identify inefficiencies in the use of

resources and to derive measures to increase the company's profits in order to ensure the sustainable development of the company. (Vater, 2013)

In order to make these reports and characteristic numbers available for the further enterprise control, a well-ordered bookkeeping and report production are of essential importance. The accounting department of multinational companies is one of the most important process participants in the P2P process and has to face a much higher number of different legal requirements than is already the case with local companies. These challenges include in particular the verification and reconciliation of purchase orders, goods receipts and final invoices from the supplier, the correct country-specific account allocation of various expenses, the recognition of currency differences and the continuous master data maintenance of suppliers and business partners. These processes are usually complicated by different formats in the respective countries, the different local languages of the countries and the constantly changing legal requirements.

In order to master the more complex processes and the increased technical requirements, there is an increased need for experienced specialists with cross-functional expertise. Due to the increasing demands on the roles of the process participants in the Purchase-to-Pay process, continuous personnel development is required to ensure that they have the optimal level of knowledge for the efficient handling of multinational activities. (Umbenhauer, Flynn, & Mitchell, 2019)

As can be seen from the above-mentioned aspects, a multinational company faces many challenges that can have a decisive influence on the company's success, existence and growth. The listed aspects are only a small part of the factors that influence the purchase-to-pay process and that have to be managed by strategic and tactical decisions.

4.2 Digital transformation impact

We have now analyzed the basic functionalities of the selected exponential technologies, as well as the structure and challenges of the P2P process, which already allows us to derive some business value impacts.

In this part of the directed research, the specific role of the four exponential technologies along the P2P process, the resulting opportunities, risks and business value impacts, will be analyzed and compared to arrive at an assessment of each technology.

4.2.1 Cloud Computing

Due to the characteristics of cloud computing and its diverse application possibilities, one can particularly see the advantages of cost-effectiveness by reducing cost-intensive investments in the construction, maintenance and expansion of computing power and storage capacities, flexible decentralized access to data and information through network access and easy linking with other technologies through standardized interfaces. Especially for multinational companies, the access to data records generated at the company's other locations is essential for the strategic and operational management of the company. Along the P2P process, the provision and exchange of information about orders and the associated documentation effort is very important for efficient further processing by the individual process participants and can lead to very high time expenditure if executed inefficiently. Through the more cost-effective cloud solutions and the easy implementation without the need of specialized experts, companies have been able to increase their capacities in the digital infrastructure exponentially at lower costs and adapt them to the constantly changing environment in order to achieve the highest benefit from the consumption-based cost models and thus a higher ROI. (Xue & Xin, 2016)

However, cloud technology not only has advantages, but also has several risks and disadvantages due to its resource sharing and access via shared networks. Data security and illegal access to sensitive information is one of the biggest risks of the cloud and can have

serious economic consequences. (IBM, 2020) The number of cyber-attacks on companies has grown exponentially in recent years due to their increased online presence and has in some cases caused great damage by manipulating important data sets. (Sobers, 2020) In addition, regulatory data protection laws have been introduced by public authorities to protect sensitive information, which is severely punished if not complied with. As a result, not only the legal position, but also the reputation of the company is endangered if this protected information is unlawfully appropriated. Many process participants could be forced to stop their information exchange and business relationship for security reasons, which would result in considerable economic damage. Another financial but also strategic risk could be an uncoordinated and inefficient management of cloud storage capacities, resulting in very high costs with little added value and thus negatively affecting the ROI. (Linthicum, 2020)

4.2.2 Advanced Analytics

The demand for advanced analytics technologies has also grown very strongly in recent years due to greater data awareness. Due to this awareness of data availability and the recognition of potential benefits, more and more companies are trying to achieve a deep mastery of advanced data analysis to support evidence-based decisions. This enables them to conduct detailed research along the value-added processes of the company and thus to identify inefficiencies, especially along the P2P process, and to implement strategic as well as operational optimizations to reduce cost-intensive and capital-intensive processes. (Expert 5) Companies are able to make certain predictions about demand quantities through the analysis possibilities, which allow a more efficient design of production processes, order quantities from suppliers, inventory levels, an improved utilization of warehouse capacities as well as a better budget planning, whereby not only cost reductions in the procurement of goods, with more efficient use of personnel and with better logistics planning, but also the performance can be increased,

the turnover can be optimized and bottleneck processes can be eliminated at an early stage in order to be able to represent a reliable source of supply of products for the customer.

Even though the constantly growing and available amount of data creates many analysis possibilities, special basic problems such as inconsistent data quality, the correct evaluation of the large amount of irrelevant data sets and incorrect analysis methods must first be eliminated in order to avoid wrong decisions due to inaccurate analyses, which can lead to a significant economic risk. Another problem is the higher complexity in implementing advanced analytics systems and in using them, which requires a higher demand for cost-intensive subject matter experts who can strongly influence the cost-benefit ratio. (Expert 5)

4.2.3 Artificial Intelligence

Through the automation capabilities of Artificial Intelligence, companies are able to accelerate especially the standardized support processes of P2P and thereby design a more efficient human resource utilization. Consequently, the use of personnel can be reduced, financial advantages can be achieved through cost reduction and the focus can be placed on value-adding main processes in order to create a more productive operational procurement. (Bauer et al, 2017) A particularly important application of AI is the conversion of different data formats in order to ensure data consistency and thus enable more qualitative analyses for fact-based decision making. (Signavio, 2020) However, in practice there are still some challenges and risks that limit the application possibilities of AI significantly. Due to the still very highly individualized and manual process steps and the analog data formats that are widely used in many countries, AI cannot be used or only to a very limited extent, which means that the actual impact on business value can be minimal. (Expert 6) Many companies have built up an extensive modular system landscape over the years with inconsistent and unstructured data quality as well as location-dependent process conditions, which means that the basic requirements of correct statistical calculation and pattern recognition that are essential for the further decision-making

processes of the AI, cannot be guaranteed. (Bergstein, 2020) Automated process flows due to incorrect data analysis can pose a major risk to the economic success of the company. (Cheatham, Javanmardian, & Samandari, 2019)

4.2.4 Blockchain

Especially multinational process participants with often very untransparent validation processes have an increased risk of trust, which can be reduced by the blockchain. Businesses are able to build their own data chains, share their data chains with other value-added partners and thereby exchange validated information between collaborating companies. A very important function of the blockchain is the near real-time transaction of financial resources and automated liquidity information, which can reduce the risk of payment defaults and liquidity gaps due to late payments. The supplier agreements can be defined using Smart Contracts, which allows the exchange of information, cash and goods to be continuously documented in the blockchain as well as automatically checked for deviations. As a result, a company has complete transparency over the exchange of the individual process participants, can directly identify deviations and can thus save time-consuming documentation and investigation work. Even though the technology could provide a very high added value for many companies, it is not yet technically mature enough to be used by companies. Furthermore, the introduction of such a disruptive technology and its complete value creation is only possible through the acceptance and cooperation of the majority of participants in the value chain. Weaknesses such as the very high consumption of IT resources, the need for not yet sufficiently available expertise in this area of technology and the high financial expenditure prevent an integration of blockchain technology with value-adding influence. (Expert 2)

4.3 Assessment of business value impact of exponential technologies

Based on the above-mentioned application examples and its business value impacts, a few very clear conclusions can be derived.

Cloud computing can be implemented very quickly and easily due to its characteristics and comparative ease of use, without the need for very high additional investments. The positive business value impact can be created especially through the permanent data availability and more streamlined information exchange, as well as a more efficient arrangement of tied-up capital by eliminating the need to establish and maintain in-house IT infrastructures. Of course, the risk of misappropriation of information by third parties and the complexity of the data structures must be considered, but the advantages outweigh the disadvantages, especially in terms of lower costs, the conservation of resources, more efficient information exchange and the acceleration of communication through a central storage source in order to strive for uniform data consistency.

The advanced analytics technology offers a powerful contribution to decision-making processes through its detailed and extensive calculation capabilities in order to be able to carry out these more accelerated and evidence-based and thereby achieve a faster response capability, allowing weaknesses and the resulting additional costs to be identified and reduced at an early stage. A company can deal more consciously with costs, process performance, resource usage, supplier profiles and other influencing factors, thus reducing business risks. However, these positive influencing factors are also offset by some negative ones, such as poor data quality, inconsistencies in data formats and a lack of specialist expertise among employees in the use of the technologies, which can be rectified through additional investments and measures. Basically, through the assessment of the subject matter experts, one can see very positive trends of business value impact through the data awareness created by the use of advanced analytics technologies in the P2P process.

Artificial intelligence is still a very complex technology, which already show some positive impacts such as cost reduction through saving of human resources by automating standardized processes, acceleration of non-value adding processes and the calculation of different scenarios,

which contribute to an improvement of fact-based decision-making processes, however, the implementation faces a lot of challenges. (Dirican, 2015) The current subject matter expertise of the employees of many companies do not currently allow for independent implementation of this technology, creating a large knowledge gap that can only be closed by very high investment in external subject matter experts. In addition, artificial intelligence can currently only be used in a very limited number of standard processes, which so far only cover a small share of value creation and thus cannot yet show a positive investment result.

On the one hand, the Blockchain technology holds out the prospect of promising application possibilities, especially in ensuring data consistency and the simpler transmission of transactions, which could show important positive contributions for the use of other digital technologies, for a higher quality decision-making basis and especially for strengthening the level of trust as well as reducing misunderstandings of the business partners involved. On the other hand, the introduction of blockchain technology is faced with very high investments in the development of the necessary infrastructure and expertise, very high costs in the use of the technology and the global participation of value creation partners as a basic prerequisite, which at the current state do not have an overwhelming positive economic, social and environmental impact on the business value.

5 Conclusion

In conclusion, there are still many challenges that companies have to overcome in order to use exponential technologies on a larger scale. Numerous positive effects on the value of the company can already be identified, which result from the shortening and acceleration of communication processes and the resulting better networking with the process participants involved. Multinational companies have the opportunity to expand and strengthen global relationships, to gain transparency and overview of global and complex business processes, to reduce their complexity and especially the time required for processing, and to make fact-based

decisions that go beyond the operational purchasing process due to the greatly increased availability of information. These positive impacts are achieved in particular through cloud technology and advanced analytics technologies, which create a basis for simplified, future-oriented management through their functionalities. However, the potential of exponential technologies is still not being fully exploited, which is reflected in particular in the maturity and applicability of certain technologies along the value-added processes, in the change management of corporate cultures, in the agility and skillset of the personnel. The implementation of a fully functional and fully integrated exponential technology still faces many challenges, which can usually only be overcome by a combination of high investments in external expert knowledge, in a much more extensive IT equipment, in the development of internal business experts with the necessary IT-specific know-how as well as extensive restructuring measures. Particularly complex is the evaluation of available technologies and the assessment of the interdependent relationships with the respective providers, whereby a company usually binds itself to a provider for a long period of time, thus creating a very close relationship of trust and dependency, which could restrict a company in future decisions. In addition, transparency and publicly accessible and clearly detailed information provide companies with a greater opportunity for misappropriation and use of sensitive information, which can limit the company's competitiveness and the risk can only be reduced by additional investment in security measures.

Although there is already a wide range of different exponential technologies, there is still a lot of development work to be done, stronger security measures have to be generated, a better understanding of these IT technologies has to be spread, easier handling has to be aimed for and a stronger adaptation to IT system landscapes and cross-system functionality has to be created in order to fully exploit the potential of exponential technologies to generate more positive business value impacts.

6 Limitations and further research

As we have already seen at the beginning of this directed research through the definition of business value impact, the true extent and exact impact of exponential technologies cannot be accurately measured and determined due to the convergence of so many different influencing factors. This difficulty in measuring impact, the limited scope of this work, and the limited availability of sensitive information such as performance metrics, investment reports, internal financial reports, financial ratios, and stakeholder reports consequently do not allow for a more detailed analysis of business value impact. Through the interviews, the individual experts were able to provide very good initial insights into the actual realizable impact and challenges of disruptive technologies on the P2P process of multinational companies. However, despite the different positions, areas of responsibility and business models of the individual companies, these are subjective views of each expert and are therefore shaped by personal experiences and different levels of knowledge about digital technologies, that can influence the conclusions of the interviews.

Based on this work, a lot of further research directions can be identified in order to analyze the influence of exponential technologies on the P2P process of multinational companies in more detail. A further research could specialize in comparing the influence of exponential technologies on P2P processes of different business models of multinational companies to identify which business model will achieve the greatest impacts. In addition, it may be possible to study the detailed impact of an exponential technology implementation project at a single multinational company to assess the financial, social, and environmental impacts that this implementation has generated over a given period of time. These further research areas could support a detailed and insightful evaluation of the business value impact of exponential technologies on the procure-to-pay process.

7 Appendix

7.1 References

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7.2 Expert Interviews

7.2.1 Expert 1

Short description	- The expert is a Management Consultant of an international Management Consulting company that has a strong specialization in Management Accounting, process optimization digital transformation and reporting. - He is specialized in Digital Transformation of P2P Processes and financial and management accounting issues. - He has a collected a broad repertoire in experiences over the last 7 years in consulting more than 15 clients of various industries and with various business models. His actual project is the optimization and digital transformation of the P2P process of a German multinational automotive OEM.
Definitions and general information	
How would you define the business value impact?	- In today's world, many influences can change the value of business, not just the financial aspect. - Or how do you explain that a young automotive group like Tesla can grow into the most valuable car manufacturer in the world in just a few years without any operating profits? - Many companies are called upon by politics, legislation or stakeholders to take more responsibility for the value creation processes and their environmental or social impact, which can have very positive effects, as you can see at Tesla
How would you describe the role of purchasing within a company?	- The role of purchasing has developed into a key function of the company, especially in recent times, when a lot of attention is paid to cost savings and sustainable management. - More and more to a strategic decision partner for outsourcing or integration issues, as they have the best insight into market prices, quality characteristics of products on the market or supply risk
P2P of multinationals	
What role does the P2P process perform for multinational companies?	- It depends on the business model of the company. For companies without a large demand for purchased goods (due to extensive integration in the value chain such as raw material production) the P2P process is not prioritized. For companies with a low level of integration in the value chain, the P2P process is definitely one of the most important main processes of the company

How can the P2P process be defined / restricted?	- There is no clear and firmly defined limitation of the P2P process. - Many companies look at the complete purchasing process (including sourcing) when they consider the P2P process. Some large companies differentiate sourcing from P2P, as they tend to focus on the purely operational ordering process to reduce inefficiencies in standard processes.
What challenges do you see in general P2P processes?	- Especially the information exchange of important documents, still a lot of manual documents that have to be digitized and checked (costs a lot of time) - Partly unclearly defined contract terms
Are there any special challenges especially for multinational companies?	- In my last project, the client had extreme difficulties with the individual country-specific reporting, especially with the tax treatment of purchased goods and their internal settlement with other locations in different countries
Digital transformation	
How do you assess the current status of corporate digitization?	- Many German companies are just trying to move from paper-based transactions to digital transactions. - In comparison with other countries (especially with foreign locations of German companies), it can be said that German companies are relatively far with digitalization, especially with regard to core systems (such as ERP, CRM, reporting, etc.) - However, there is still a great demand for the introduction of new technologies to make processes and transactions more transparent, clearer and more efficient
Can the companies still work without IT-supported processes?	- It always depends on the company's size, industry, business models, digital processes and other factors to be able to evaluate this. - Many large multinational companies can no longer operate without a functioning IT infrastructure. The amount of information, the exchange of information and the processing of information are so extensive in today's world and the time pressure of value creation is so intense that this could no longer be managed without technological support.
What challenges do companies face when introducing new technologies?	- The necessary expertise to operate and use the technologies => through training of employees or new personnel with the necessary skills - IT infrastructure is a very important aspect for the introduction of new technologies, many companies have to upgrade their equipment to provide the necessary performance
Human Ressources: How do the employees of the individual companies view digitization?	- For the majority of my digitization projects, employees were very critical of the introduction of new technologies (especially among long-serving and older employees who are worried about their comfort zone or workplace). Since transformation projects usually require a longer period of consulting support, a change in the attitude of individual employees can be seen in some projects. The initial skepticism is resolved by a more intensive integration of the individual process owners in decision-making processes and then a transformation can take place. Many employees or employee representatives (e.g. works council) are very strongly opposed to change, which can cause a transformation project to fail, especially when new technologies are introduced.
Are core technologies still necessary or are exponential technologies sufficient?	- Core technologies are currently the important building blocks for the exponential technologies that are currently only working in combination. - Especially in the area of advanced analytics we consolidate and use the database of the individual core technologies (transaction and meta data of the individual systems)

Do you see an opportunity in the introduction and use of exponential technologies?	- The new technologies offer a variety of possibilities for companies, especially when it comes to automation, transparency and documentation/reporting (clients were able to save more than 30% of human resources in Accounting + up to 60% less compliance conflicts), all aspects that are crucial for process optimization, so I think yes, definitely. However, the challenges and the rapid development of these technologies must also be considered. - The introduction of new technologies can take up a lot of time and resources, which could be "outdated" again after a short time. For this reason, an optimal mix of core and exponential technologies has to be agreed upon in order to build a solid and at least medium-term basis to achieve a return on investment (Initially projected costs of implementation projects mostly double till end of project)
Which exponential technology is currently most in demand?	- Cloud technology is currently one of the most important upgrades for many companies. Already over the last few years, with the trend towards centralizing certain departments of multinational corporations to reduce costs, the need for remote access to certain data has increased dramatically, and the Covid-19 pandemic has further increased this need as workplaces have moved from presence to remote (as much as possible) and continue to be so
Summary / Recommendation	- The digital innovations provide a great deal of insight into the individual processes, especially in the P2P area, thus increasing the possibilities for identifying optimization potential. A lot of financial resources can be saved, the entire business model of a company can develops further and companies can react more flexibly to changes. - However, companies have to deal intensively with such technologies and build up internal know-how in order not to be constantly dependent on external service providers, who are very cost-intensive and usually have no detailed insight into the actual problem areas of the processes.

7.2.2 Expert 2

Introduction about expert	
Short Description	- The technology expert is working for an Austrian private equity company that owns, invests and work with blockchain technology firms. - The expert is a specialist of exponential technologies (with a strong focus on Blockchain technology) and has to evaluate and rate the product portfolio of technology companies as well as the company itself. He has more than 8 years of experience in the field of exponential technologies and his daily business is the analysis of markets, companies with big opportunities and technologies.
Definitions and general information	

How would you define the business value impact?	- A fixed definition is probably very difficult to form, since there are different influences of goodwill for each company. - I would say that the financial factor plays an important role for very many companies. But not for all of them either, as you can see in a car company like Tesla (which had negative annual results over the years). Here, the focus was particularly on sustainability (resource conservation and increased efficiency in the use of resources), the role of stakeholders (numerous investors were convinced by the transparency of progress in research and development) and the image / reputation of the company (very strong trust of customers and investors in the brand and especially in the company founder, who himself runs a very customer-oriented marketing). - Over the last few years, it has been clearly observed that companies are paying more attention to the optimization of internal business processes and the increase of efficiency, but that they also attach great importance to the role of stakeholders and corporate social responsibility. - Because much more information about people and companies is publicly available today, it is important for many companies to have a positive image. Even the smallest negative changes can have serious consequences on the attractiveness of a company in the digital age.
How do you define exponential technologies?	- The performance of today's computers has increased dramatically over the last few years. - According to Little's definition, exponential technologies show an exponential growth of performance (processor power, memory capacity, etc.) over a given period. - Over the last few years there has been particularly strong growth in cloud technology, Internet of Things technology and advanced analytics technologies.
Digital Transformation	
How do you assess the current status of corporate digitization?	- It depends strongly on the geographical development of the company's locations and especially on the business model of a company - Overall, I would say that although we have a good digital status here in the German-speaking countries in relation to many other countries, there are still a lot of possibilities here to make various processes even simpler and faster. Unfortunately, we are lagging behind many other countries with our digital infrastructure and are therefore often limited in our ability to take full advantage of the possibilities.
Can the companies still work without IT-supported processes?	- Nowadays, companies in German-speaking countries find it very difficult to operate without IT technology, or they would have to invest considerable effort. - Just the interdepartmental or cross-location transfer of information alone would take several days without information technology nowadays and generate considerable costs. - Due to globalization and the high level of international competition, companies can no longer afford such delays and such inert processes.
What challenges do companies face when introducing new technologies?	- Due to the wide range of technology providers it is important to make a proper evaluation of these technologies to find a suitable solution for the company. - For this purpose, many companies lack the know-how, which they have to introduce by additional qualified personnel. Due to this gap in know-how, many companies are bound in the long run to a cooperation with a technology provider or an external consulting company, which can also be a risk (especially due to the high financial factor). - There are numerous digital technologies on the market, which are constantly changing and evolving, making the strategic decision to invest in a particular technology and the associated build-up of resources very difficult.

Are core technologies still necessary or are exponential technologies sufficient?	- The core technologies form the transactional basis for all other technologies. Companies cannot yet do without the core technologies because they execute commands from employees and thus convert human actions into digital ones. - How strong the relationship between core and exponential technologies should be in order to get an optimal business state depends of course also strongly on the business model of the company. - For example, a streaming service such as Netflix has a very large proportion of exponential technologies and a manufacturing company such as Bosch has a larger proportion of core technologies.
Do you see opportunities in the introduction and use of exponential technologies?	- Yes, definitely. - Through these digital technologies, new markets and especially new business models have developed, without which today's people can no longer live. (As an example: Netflix, Airbnb, Zalando, Misterspex, etc. who have only achieved this level of business through exponential technologies. - Netflix stores all its data in the cloud, which provides worldwide access to its product portfolio.
Which exponential technology is currently most in demand?	- Over the last couple of years, an extreme increase in the demand and also in the supply of cloud technologies has been observed. - Many companies are paying more and more attention to their expenses (especially for long-term investments) and as the demand for computing power, storage capacity has increased rapidly over the last decade, companies are looking for solutions that they can expand very quickly and which are best linked to actual consumption. All unused capacity is detrimental to ROI and is therefore not in demand by companies. - Other important technologies are Big Data Analytics and Internet of Things, because they are suitable for the analysis, planning and detection of changes in the market. Companies can use this analysis to create a much more optimized picture of markets, customers and even their own company. - In the meantime, companies have understood that data is worth more than oil and that by using this data they can generate certain business benefits (detailed insights into customer behavior, detailed insights into internal business processes and thereby recognize potential for improvement, detailed market insights and comparison possibilities, etc.).
In the last 4 years, you have also concentrated particularly strongly on block chain technology. How would you describe the technology?	- An enormous use potential for the future economies world-wide by the Blockchain technology which go far beyond the crypto currencies and the nearly real-time transaction of financial means. - Through the continuous storage and updating of data in a data chain, all process participants are always up to date. - Verification processes mean there are fewer opportunities to cheat - Especially in certificate commerce or in the pharmaceutical industry, where an exact traceability of the value chain has to be ensured, the use of a block chain is very promising - On the procurement side, this can create greater transparency, eliminate fake goods, minimize risk by verifying the identity of those involved in the process and simplify the transfer of key information required for legal reporting in accounting
Summary / Recommendation	- Many companies now have a greater understanding of digitization and recognize the value of data - Exponential technologies develop very quickly and not every technology trend should be implemented by companies, as this could have a negative impact such as overburdening employees and other stakeholders - Companies should be particularly aware of the points at which data should be collected, analyzed and used for which decision-making processes, otherwise some negative consequences can arise

7.2.3 Expert 3

Introduction about expert	
Short description	- Managing Director of a medium-sized company, more than 25 years of experience in purchasing, production, sales and project management - Medium-sized company with technical products in insulation technology and technical services in the mechanical engineering industry with over 500 employees at several locations in Germany, Slovakia, Spain, Dubai, Abu Dhabi, America, China and Singapore and worldwide project work
Definitions and general information	
How would you define the business value impact?	- Continuous positive growth is essential to secure the company's existence - Maintaining financial resources is an important factor in managing the operational business. - However, financial resources alone are not enough. We are a manufacturing company and can only convince the market with high quality and absolute reliability. - The employees are an essential factor without whom the company could not work, could not develop and would not be sustainable. - Especially in times of globalization with international competition, it is crucial for us to continuously improve the company, optimize existing processes and integrate new developments.
How would you describe the role of purchasing within a company?	- A mix of strategic and tactical partners without whom we cannot manufacture products - Purchasing is a department responsible for the provision of resources. If this is flawed, further value creation does not work and we cannot generate sales
P2P of multinationals	
What role does the P2P process perform for multinational companies?	- - An essential driver of a company's value creation, not only for production companies
Is your purchasing predominantly strategic or reactive?	- Our purchasing is organized locally from each production site with the decisive advantage that we are relatively flexible with the procurement of goods - In order to keep the capital tied up in inventories as low as possible, we place orders predominantly in response to customer demand.
How can the P2P process be defined / restricted?	- We include supplier selection in the P2P process because there are a small number of suppliers at each local site who can meet our quality expectations for certain materials. - The P2P process is triggered by a customer order, which forwards the demand for material to the purchasing department, which then discusses the offers of the inquiry with the possible suppliers. Here we retain the flexibility to select suppliers according to the order, as we can generate price advantages from competing suppliers. Subsequently, the purchase orders are passed on to the logistics and accounting departments. After receipt of the goods, the confirmation of receipt is passed on to the accounts payable department, which performs a deviation analysis and makes the payment run accordingly.

What challenges do you see in general P2P processes?	- The communication and efficient exchange of information between sales, project management, purchasing, accounting and logistics is a major effort - Exchange rate differences are decisive factors for our purchase prices, which have a great influence on the profit margin - Quality assurance is a decisive factor for our products, which must be differently pronounced from country to country (country-specific qualities) - Political and legal guidelines such as sanctions, customs duties or different accounting standards are very challenging, as they can change relatively quickly - Language barriers at the individual locations greatly limit the efficient exchange of information, which can lead to delays
Digital Transformation	
Can the companies still work without IT-supported processes?	- No, in companies with international locations, IT-supported processes are essential for the continuous exchange of information. - Our customers abroad appreciate a regular exchange of information, which is an essential factor for the high quality of our custom-made products. - Similarly, even we, as a relatively small company, could not conduct an efficient exchange with other locations, suppliers, banking institutions, customers, etc.
How do you assess the current state of digitization in your company?	- I think we have created a solid basis for a digital infrastructure, but we are nowhere near as digital as large corporations
What challenges do companies face when introducing new technologies?	- The operability of the systems and the training of the employees is one of the biggest challenges. If the employees are not able to handle the systems, they cannot work with them properly. - Our employees are relatively specialized in the individual technical fields, but not very strong in the IT area (Trainings binds manhours that costs us around 500k$/per year as opportunity costs) - The IT infrastructure at the individual locations is difficult to set up in different ways, as some countries are very sparing in their efforts to build digital infrastructures. - A large number of stakeholder processes are still carried out in analog form (which also depends on the country), which means that digital technologies can only be introduced to a limited extent. (around 45% are still analog form)
Human Resources: How do the employees of the individual companies view digitization?	- Employees are rather critical of the introduction of new technologies because they are not familiar with them at first and have not dealt with them
Are exponential technologies already used in your companies?	- We use cloud systems to exchange information with the other sites and business intelligence systems to analyze certain projects and operational performance of individual sites
Are core technologies still necessary or are exponential technologies sufficient?	- We recognize the benefits of exponential technologies and use them even on a small scale, but we have to critically evaluate which systems actually generate added value for us and can only rely on established systems in this respect. I think there are still many challenges for technology providers to make these modern technologies usable for SMEs.
Do you see an opportunity in the introduction and use of exponential technologies?	- Thanks to the Cloud and BI technology, we were able to make our information exchange and the individual processes much more transparent. As a result, we have discovered a lot of potential for improvement, which we want to use continuously. (were able save around 40% in manhours in procurement and around 30% in accounting) - We were able to improve communication and centralize certain administrative processes to save costs and economize resources. (speed up transactional processes, faster decision-making less delay time)

7.2.4 Expert 4

Introduction about expert	
Short description	- The expert works as a central purchasing manager for the continent of Europe for a global production group of thermal management systems and components in the automotive and aerospace industries - Has been working for the Group for more than 20 years and has worked his way from the purchasing officer to the strategic and operative management level of the purchasing department - The company has nearly 9,000 employees at more than 20 locations in 15 different countries and generates total annual sales of $2 billion
Definitions and general information	
How would you define the business value impact?	- The number of influences on the goodwill can be very high. This depends very much on the business model, the ownership structure (number and interest of stakeholders, especially the interests of shareholders), the industry and market conditions, the legal requirements (which are much higher for a public company than for a smaller company), and many other factors. - Due to globalization and the market situation, which is strongly influenced by it, a company is exposed to a very high pressure to gain a competitive advantage over its competitors. - A business impact on the company can mainly be caused by the different interests of the stakeholders (employees, investors, suppliers, customers, credit institutions, etc.), the financial resources, the market position and the appearance of the company, as well as the legal and political framework agreements such as trade contracts.
How would you describe the role of purchasing within a company?	- In my opinion, purchasing is the most important unit of a company. - If the procurement of resources does not work, the company cannot work either. - Because we purchase a lot of semi-finished parts from suppliers, the purchasing volume in our company is about 55% of the total costs and is therefore a very important part of the value creation of the company.
P2P of multinationals	
What role does the P2P process play for multinational companies?	- The Procure-to-pay process is seen as one of the main processes in the company. If the procurement process is not implemented efficiently and works well, a manufacturing company is not able to work optimally.
How can the P2P process be defined / restricted?	- There are several core processes in operational purchasing, such as requirement requests, supplier offers, the actual order, delivery of the order, invoicing and payment. - These processes can be arranged however very differently: There is the distinction between direct and indirect order, mainly one differentiates here whether it is completed over the central purchase department or by other departments such as production, administration, etc. and whether a delivery plan exists or not. - Mainly it comes to the indirect purchases by "Maverick buyings", which do not run into the tidy Scope of the order process. An employee of another department takes over the selection of a supplier (=dem sourcing) and the execution of an order at the same time. Such cases are however rather the exception. - The strategic purchase processes differ from the operational ones mainly by the supplier search, the supplier examination and certifying, the supplier selection, the product examination and the consideration of strategic collaborations with suppliers
What challenges do you see for general P2P processes?	- The efficient design and coordination of customer orders, warehouse management and supplier orders are one of the biggest challenges in the operational purchasing process. - Many factors have to be considered and linked together at the same time in order to generate an optimal purchasing behavior. There are many variables to consider such as delivery times, order period, order quantity

	from customers, optimization of stock levels, delivery reliability, risk minimization and cost optimization. - These coordination efforts increase especially when outsourcing certain production processes to business partners, as the number of suppliers increases and additional quality assurance measures are necessary. - The automotive industry represents one of the most complex value-added chains in the world and one of the highest listed industries in the maturity model, since there is enormous cost and competitive pressure on the individual value-added participants and therefore a continuous need for efficiency increases is essential. - Authorization concepts, definition of areas of responsibility and approval processes are one of the most important but also biggest challenges in a company. A public limited company is obliged to establish authorization structures and to check them regularly, as otherwise an enormous corporate risk could arise from misconduct. - In the international context, there are legal variables such as customs clearance, additional import duties, different tax treatments; political variables such as trade agreements or sanctions; logistical variables such as extended transport routes and transport times or transport risks and many other variables to consider.
Digital Transformation	
Can the companies still work without IT-supported processes?	- Our company can no longer function without IT. - The coordination of the extensive requirements and the influence of stakeholders such as communication with suppliers, with credit institutions or even within our company with the different sales, production, warehouse and administration locations would no longer be efficiently realizable without IT technology.
How do you assess the current state of digitization of companies?	- The automotive industry is highly digitalized. The networking of the individual value-added partners is essential for the handling of continuous production quantities with high volumes
What challenges do companies face when introducing new technologies?	- In any case, evaluating the systems and adapting them to the different corporate structures in the various countries is a major challenge. - The IT affinity of the employees is a very big challenge - Adapting the systems to existing processes is very difficult and often involves very high investments. Many technology providers want the company to adapt to the standard of the system, but this is very difficult to implement with strongly rooted processes.
Human Resources: How do the employees of the individual companies view digitization?	- There are different views depending on position, level of knowledge, age, etc. - No dislike but very critical attitude about the change in the workplace due to the introduction of new technologies. - For younger people it is easier to deal with these changes, for older people it is sometimes very difficult to acquire IT know-how, but they have the professional experience and are key factors in the purchasing department. - I think a balance between professional expertise for the exercise of purchasing activities and the necessary know-how about IT is the key to success.
Are core technologies still necessary or are exponential technologies sufficient?	- Core technologies like ERP or SRM systems are essential for us. They manage and control the operative business and will continue to be the drivers of our business processes in the future. - I think the exponential technologies are a good ad-on for improving processes, but they are not the main drivers yet

Do you see opportunities in the introduction and use of exponential technologies?	- The possibilities and potential benefits of modern digital technologies are certainly very high. By storing certain information in the cloud, we are able to set up central shared service centers in the areas of purchasing, sales, accounting and human resource management and manage these units at the company headquarters. - We work with very high volumes of parts provided by more than 2,000 different suppliers, which requires a considerable amount of coordination, where a small miscalculation in purchasing can have a very high impact on the operating result. (Save around 50% of administration time) - Through detailed analyses within the individual cost sources, many optimization potentials can certainly be identified. (Were able to save around 15% in purchase expenditure due to better cost calculation) - However, there are also some weak points, such as the high running IT costs, additional security measures for data, increased investments in the IT department for the continuous assurance of the functionality of these digital technologies and the time-consuming training, which ties up a lot of personnel capacity even for small changes. For this reason, we are usually dependent on external specialists who introduce or further develop such technologies, which can represent high investment costs. (more than 2 million $ in consultancy fee per year)
Which exponential technology is currently most in demand?	- In the operational purchasing area, we mainly use cloud technology for the storage of relevant cross-location information, analytical systems for the calculation of demand and order quantities as well as for the calculation of the budget distribution for specific assemblies - We also use Internet of Things sensor technology in warehouse management to keep an eye on safety stocks.
Summary / Recommendation	- The exponential technologies can certainly add value to operational and strategic business processes, but there are still many weaknesses that should be addressed first. - Technology providers should focus even more on customer problems and in particular improve the user-friendliness of their digital solutions to ensure correct applicability.

7.2.5 Expert 5

Introduction about expert	
Short description	- Has long been working in strategy consulting with focus on optimization of purchasing processes - Now for 3 years working as Project Manager in the P2P area for a rising technology company offering systems based on process mining technology - The technology company is one of the pioneers of process mining technology, whose potential is recognized and utilized by a growing customer base (90% market share of process mining technology providers). With the technology provided, companies can visualize certain processes and analyze weak points along the process chains. Especially along the purchasing process the company has a high potential for success.
Definitions and general information	
How would you define the business value impact?	- The influences on goodwill are defined differently depending on corporate policy, business model, type of company and stakeholders. - There are monetary and non-monetary influences: Influences which have a direct impact on the financial resources of a company or have no direct (but possibly indirect) influence - There are social influences, such as the company's reputation or the observance of compliance regulations, which can have an equally important influence on the company's success and the financial resources associated with it

How would you describe the role of purchasing within a company?	- The importance of purchasing is very high, but also depends very much on the business model and the integration in the value chain (For a retail company, purchasing and sales are the most important corporate factor without which the company could not exist)
P2P of multinationals	
How can the P2P process be defined / restricted?	- The P2P process is seen by many of my clients (mostly public companies with over 1 billion in sales and over 10,000 employees) without the sourcing activities and is strictly separated. - The sourcing process is usually a very complex procedure to accredit a supplier for the operational purchasing process. - In all industries, the P2P process represents the majority of the value-added share on the procurement side - The P2P process mainly includes the evaluation of requirements, the ordering process with suppliers, the recording and evaluation of services, the recording and processing of invoices and the payment of services
What role does the P2P process perform for multinational companies?	- Even the smallest optimization along the P2P process can have a significant long-term impact on the operating result, which is particularly noticeable in the P&L of large companies
What challenges do you see in P2P processes?	- The continuous exchange of information and coordination with the process participants (especially across departments) - Compliance with internal company guidelines - Compliance with legal guidelines, especially for companies with locations abroad (different legal guidelines in reporting) - The fulfillment of the company's strategic objectives (continuous cost reduction) - The efficient coordination of the increasing number of business partners that have emerged through the outsourcing of certain value-added processes.
Digital Transformation	
How do you assess the current status of corporate digitization?	- For many companies it is essential that they take a deeper look at the digital technologies that are already available in order to enhance their attractiveness and competitiveness and thus ensure the sustainable further development of the company, its products and services and their links to other stakeholders (e.g. customers, shareholders, etc.). - Some digital technologies have not yet really reached maturity, but the existing potential benefits of market-ready technologies have not yet been fully exploited by companies - Fortune 500 companies spend over $500 billion a year on IT investments
Can the companies still work without IT-supported processes?	- No, because the environment in which companies find themselves has also developed strongly digitally, which means that certain process steps can no longer be carried out in analog form. - Examples of this are the reporting of taxable documents to tax authorities or the transaction of financial resources

What challenges do companies face when introducing new technologies?	- Change management is one of the most important factors in the transformation or migration of new technologies. - It is important that the acceptance of the employees is there and that they are properly trained to handle the new technologies. - If this is not given, information can be gained, but it is difficult to guarantee the accuracy of the information and one could have wrong information in the analyses, which can lead to wrong decisions and follow-up processes. - The know-how for new systems is not yet very developed in most companies, which means that new resources have to be built - Sponsorship of the management level of the companies often poses a problem for the introduction of the technologies - The biggest risk during implementation is the human factor (low adaptability, high error rates, a rigid and inflexible corporate culture) - The companies on the Fortune 500 list have more than 300 systems running in parallel, creating an enormously complex IT infrastructure, which makes implementation very complex due to the different programming languages, data formats and interfaces - The partial introduction of certain exponential technologies (such as RPAs or machine learning) can lead to very large bottlenecks in upstream and downstream processes. - Incorrect calibration of AI systems can lead to wrong decisions and thus to severe economic consequences
Are core technologies still necessary or are exponential technologies sufficient?	- Exponential technologies use the information from transactional core systems and are therefore the essential engine of exponential technologies
You are an expert in the field of Advanced Analytics. Where do you see the biggest advantages and disadvantages?	- There are advantages through the transparency of processes, whereby weak points can be analyzed and processed better and in more detail. - Companies no longer work with assumptions but with a targeted statistical evaluation of data, which allows fact-based decisions to be made - Disadvantages are especially in the data quality (more than 90% of the data is unusable), the resulting data consumption/resource waste, which results in very high costs for storage and processing power and can therefore have a strong negative impact on the actual ROI, as well as data consistency, which is difficult to guarantee due to the complex and continuously changing infrastructure.
Do you see opportunities in the introduction and use of exponential technologies?	- Especially in the optimization and automation of standard processes, there is a considerable benefit for companies, where many costs can be saved and processes accelerated - Due to better analysis of payment terms companies are able to save costs through cash discounts (Automotive client: was able to save 120Mio € per year through better analysis of payment terms) - Vulnerabilities can be identified and eliminated much faster before they become a risk to the company (Petrochemical client: was able to save higher charges due to on time supplier payments) - Companies can make fact-based decisions through improved information retrieval and thus assess situations much better (Automotive client: more carve-outs of unvaluable processes due to better understanding of related costs => optimize KPIs) - Companies are able to move from reactive-analytical to proactive-predictive decisions and thus to better manage the future through their own control
Which exponential technology is currently most in demand?	- The cloud is currently the most in demand, followed by advanced analytics systems (business intelligence a clear leader). - More and more intelligent components such as RPAs and machine learning are in demand, but many companies are not yet ready to use them to their full extent.

Summary / Recommendation	- Nowadays companies can control business processes much more precisely and unerringly due to the high level of information and do not have to rely on risky assumptions. They can identify weaknesses much faster and can adapt their processes accordingly. - However, many companies are still in the early stages and must first develop an awareness of how information is used in order to reap the true benefits of exponential technologies and not allow excessive waste of resources.

7.2.6 Expert 6

Introduction about expert	
Short description	- Working for 7 years in the purchasing department of the group with different positions (procurement manager, supplier relationship manager, project manager, etc.) and accompanies parallel internal optimization projects around the purchasing processes. - The expert works in one of the largest listed packaging and paper companies worldwide with about 26,000 employees in more than 100 production facilities and in more than 30 countries, mainly in Europe, Russia, North America and South Africa, which has a total turnover of more than 7 billion Euros.
Definitions and general information	
How would you define the business value impact?	- A very important factor that influences our business value is the optimized use of resources and internal transparency to achieve these optimizations. We always define the term "value" with resources. - These resources can be financial capital and cost savings, but they can also be the creation and maintenance of human resources (such as specialists with exceptional expertise who understand, redefine and therefore regularly improve the manufacturing process). - It is not so much a cost saving, but rather a "cost shifiting" that makes up our business value. - We use cost optimization from outsourcing of non-added value activities to use these resources for the internal development of business relationships with stakeholders (employees, shareholders, suppliers, customers, research institutes, etc.), employees (training and development programs) and products (resource efficient products). - The business value impact therefore has far-reaching factors that interact and interact with each other.
How would you define a multinational company?	- My company is a multinational company as it has several offices in more than one country and serves projects and customers all over the world.
How would you define exponential technologies?	- I would associate these technologies with the exponential growth of information flows that need to be processed. - Exponential technologies help to process, evaluate and use this exponentially increased volume of information.
P2P of multinationals	
What role does the P2P process perform for multinational companies?	- The P2P process is the most important main process in our company. - The production of packaging materials is a very resource-bound process, which is continuously maintained by well-functioning procurement processes. - The P2P process covers more than 40% of the value added and is valued at our company at several hundred million Euros. - If this process has bottlenecks or failures, this can have far-reaching consequences for the company. Our company is bound to long-term contracts with customers who do not tolerate any delay and therefore see a breach of contract which would result in high compensation payments. In addition, the supplier rating will be bad, which would lead to a clear competitive disadvantage and thus to enormous damage to the company's reputation. - As you can see, the P2P process is an essential factor for the existence of a manufacturing company with continuous resource requirements.

How can the P2P process be defined / restricted?	- The P2P process represents the operative procurement process and its payment processing. It differs from the S2C (Source to Contract) process, which deals with the selection of suppliers and the negotiation of long-term supplier contracts on a more strategic level. - The P2P process primarily consists of 6 core processes: Demand Request, Quotation, Purchase Order, Delivery, Invoicing and Payment. - These primary core processes are supported by numerous secondary auxiliary processes that assist in the execution of the primary processes. - These support processes are variance analyses of PO, actual delivery and the sent invoice; or the logistic demand identification/recognition that triggers the demand request. I would say that the larger the company is (depending on the business model and industry) the stronger the demarcation between S2C and P2P. - In our company, there are always difficulties in this regard, whether the responsibility for both processes should be left to the respective locations (since they know the local supplier market much better) or whether the S2C process should be centralized at the strategic level of the corporate headquarters, thereby strengthening its negotiating power.
Are there special challenges especially for multinational companies?	- One of the biggest challenges we are currently facing is the lack of transparency of the individual locations worldwide. As a result, business developments at the individual locations can only be analyzed to a limited extent. - We have a decentralized organization of the P2P processes, which means that each individual plant (106 plants around the world) handles its own operational procurement and P2P process. There are very different procurement and handling processes depending on the country. - There are still many manual processes (such as scanning and processing of handwritten invoices, translation of invoices into English, etc.) - In addition, the processes at the individual locations have become "independent" and deviate very much from the standard processes at the corporate headquarters. On the one hand, this is due to the country-specific business practices, but on the other hand, it is also very much due to the different level of knowledge of the employees in the different countries. Very strong differences can be seen in the level of human resources development, the working environment (stakeholders such as suppliers) and site development (e.g. infrastructural development such as schools, telecommunications, etc.). This results in a so-called target-performance process gap which is to be reduced by introducing standard processes and further development of employees. - An important aspect of this project is Change management and the willingness/openness of stakeholders to get used to new processes. - Another challenge is the significantly increased product portfolio, which has increased almost tenfold over the last 10 years. This portfolio has grown due to the new requirements of customers (especially in the variety of sizes, materials and functionalities of the packaging) and requires new raw materials and different material combinations, which complicate the P2P process. - Master data management is an challenging task as well. We have a pool of over 26,000 suppliers and a daily increase of 60-70 new suppliers worldwide. Keeping this master data continuously up-to-date (current invoice addresses, correct bank details, current contact persons, etc.), filtering overlaps and duplicate or incorrect entries and correcting them directly are very extensive, complex/branched and time-consuming work steps.
Digital Transformation	
How do you assess the current status of corporate digitization?	- You have to keep up with the times and prepare as a company for the digital age. Through the use of digital technologies, many improvement potentials can be identified and analyzed, especially in a manufacturing company with a continuous production process. - However, the willingness and IT knowledge of employees and the infrastructure for modern technologies is not yet the same in every country, which can make digital transformation more difficult.

Can the companies still work without IT-supported processes?	- No - Nowadays, many processes are digitalized, production machines can only be controlled by computer, customers and suppliers expect orders or order processing mostly online - If companies (at least in many industries) do not deal with modern technologies it can happen very quickly that they lose their competitive advantage and are overtaken by the competition.
What challenges do companies face when introducing new technologies?	- Change management and the state of development of the different plants/locations are two of the biggest challenges when introducing new technologies - Master Data Management is one of the biggest challenges of the company, if it is not continuously checked and verified, essential information is not available and the processes can only be done by considerable manual effort (binds 5 employees full-time) - The goal is to introduce automation (especially for repetitive processes). This requires defined structures and standard processes, which are very difficult to implement at the more than 106 plants worldwide. - The already mentioned points are complicated by an independently grown IT infrastructure with more than 35 systems at the locations worldwide (often very special self-programmed systems are necessary for the control and monitoring of the production machines, which can only be connected to the central system with difficulty)
Are core technologies still necessary or are exponential technologies sufficient?	- We rely very heavily on the core systems that form the basis of our operational business. - Exponential technologies such as the cloud is another important part of the company's operations to ensure data availability at its worldwide locations. - Advanced Analytics is used by us through Celonis' Process Mining technology, as we can connect it to our main system, but data consistency is not always given and therefore many analyses are " corrupted ". - Machine Learning and RPA is used in the area of Master Data Management, because we had a very high error potential, and in the meantime, it is automatically checked whether master data has been updated (e.g. by reading and processing information on the invoice document or e-mails) (=> saved costs of 3 full-time employees)
Which exponential technology is currently most in demand?	- Cloud and advanced analytics are the main tools we use. This gives us access to information at each individual location and enables us to carry out detailed cost and process analyses - Machine Learning is used for automatic formatting, translation into defined company standard language (English) and comparison with the agreed terms of the supplier contracts
Do you see potential in the introduction and use of exponential technologies?	- Clear competitive advantages can be achieved by using the generated information. - Through cloud and advanced analytics (process mining) we have much more insight into cost types and direct costs, individual supplier relationships, ordering processes, sales orders, warehouse capacities and production capacities in order to conduct better purchasing processes (=> were able to reduce warehouse capacities about 25%). This has enabled us to realize a great deal of optimization potential (process bottlenecks were located and outsourced => saved around 15% in this specific process costs). - However, the selection of these modern technologies is very large and many companies do not know exactly about the use and possibilities whereby also very many bad investments make or the expectation by the "society of the digital age" and the broad, but partly not completely matured product portfolio of technology providers is too high.

Do you see risks in the introduction and use of exponential technologies?	- Yes, of course there are also risks. - Wrong decisions can be made if you rely too much on the analyses and reports without being able to guarantee 100% data consistency. - If other technologies such as Artificial Intelligence were to be used, incorrect trigger points, generated by inconsistencies in data quality, could lead to incorrect ordering processes and thus to high additional costs. - Increasing data generation and information readiness greatly enhance the transparency of a company. If this confidential data and information gets to the wrong people, there is a very high security risk, which limits the position of the company.
Summary / Recommendation	- In any case, the use of modern technologies and their value-added potential should be evaluated very well and the prerequisites and also challenges for their optimal use should be known in order to realize their potential. - There are many technologies on the market that are far from being fully developed and must first go through numerous test phases to be ready for use. Furthermore, political and social orientations are important factors for the use of such technologies. - The infrastructure and also the educational programs of a country must exist in order to get local personnel with the necessary technical skills at the individual locations and make the use of the technologies possible.