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Applying AI for Future Business Models in the Textile and Fashion Value Chain

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***Abstract:** This paper aims to elaborate on the past, present and future application of Artificial Intelligence (AI) in global textile production. For this purpose, leading companies along the entire production chain will be interviewed on the topic using the World Café method at the joint conference of the International Apparel Federation (IAF) and the International Textile Manufacturers Federation (ITMF) 2024 in Samarkand, Uzbekistan. Based on the results, the biggest obstacles to the implementation of AI methods in textile production, the most promising technologies and suitable methods for supporting companies in the implementation of AI methods are empirically derived.*

I. INTRODUCTION

The fashion industry has come under pressure in recent years due to numerous changes. In addition to climate change, a growing world population and the associated scarcity of resources, the growing political pressure to find solutions to all these problems is also playing an important role [1]. The global textile industry has only been partially caught up in the cross-industry digitalisation wave of recent decades and is lagging behind political and social expectations as it is responsible for 5 % of the global carbon emissions [2]. The introduction of digital business models (DBM) along the entire value chain is key to overcoming these obstacles and offers the opportunity for a sustainable and economic transformation of the textile industry [3][4].

The definition of digital business models (DBM) changes depending on the observer. In the context of this paper, a DBM is defined as a business model that uses digital technologies, in particular AI, to increase the efficiency and profitability the production, organisation or administration of a company [5]. The already widespread use of ChatGPT and other AI applications in many large companies for administrative activities and similar repetitive tasks underlines the current trend towards the use of these technologies, which must be understood and managed by companies. Unlike traditional business models that rely on manual processes, those driven by AI integrate machine learning, data analytics, and automation to enhance operational efficiency. Therefore they require a higher level of digital expertise.[6]

Applications, that include AI or other modern day digital solutions are not yet widespread in the textile industry as it is in other branches [7]. However, companies are being forced to develop and utilise new technologies as the pace of change in their business world continues to accelerate [8]. For this reason, several AI-powered DBMs have been implemented by larger textile companies in the recent past to keep up with the demands of the modern market. Applications include fashion designs based on AI or individualised digital content that help brands predict and satisfy new needs without the need for much human input [7]. Fashion companies such as Zara are using AI to recognise and sort customer data and create unique products or at least new garments according to customer preferences, such as style, colour or material type [9]. In particular, image recognition is used to predict fashion trends based on images from social media. The model analyses the posts of well-known influencers and, in combination with the resulting reactions, can deduce whether the trend depicted will be important in the future [10][11].

With these characteristics and possibilities of DBMs in mind, an AI-driven business model can address an organization's challenges. From automating repetitive tasks and improving decision-making through data insights to creating new products and services [10]. According to a report by McKinsey [12], AI applications could generate an additional 13 trillion dollars in added value in 2030. Given this magnitude, it is imperative for every company to get to grips with the topic of AI-driven business models. This simulation is based on the assumption that AI will revolutionise existing value creation processes and make them more efficient. The report compares this to the invention of the steam engine, which changed complex manual transport processes from the ground up. In addition, new business sectors will emerge as the use of AI progresses. The report compares this development to the global availability of the internet, which forms the basis of today's tech companies such as Amazon and Alphabet. The estimate also takes into account negative influences, such as the high investment costs for digital infrastructure and the loss of jobs due to the comprehensive implementation of AI.

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To date, many DBM solutions have been developed and tested, but the use and degree of implementation varies widely across companies and parts of the world [13]. In this paper it will be discussed how the implementation has progressed along the value chain of the textile technology industry. Therefore, a survey will be conducted at the joint ITMF and IAF conference in Samarkand, Uzbekistan in which executives from the global textile technology industry will be questioned about the past, current and future status of DBMs in their companies.

The ITMF is a global trade association that represents textile manufacturers and promotes communication and collaboration between them to support the growth and sustainability of the industry (International Textile Manufacturers Federation, About ITMF, 2025, https://www.itmf.org/about-itmf). The IAF is the leading global association for the apparel industry and strengthens the development of the sector as a platform for international exchange between its individual members (IAF, About IAF - IAF, 2020, https://www.iafnet.com/about-iaf/). The members of both associations together represent the most important companies in the textile technology sector and therefore have the necessary expertise to answer questions about the current status of the use of digital business models and any shortcomings that occur by implementing them.

This collective expertise is needed to answer the question posed at the beginning about how the textile technology sector deals with digital business models. A participatory method such as Brown and Isaacs' World Café [16] will be used. The World Café method was developed in the USA in 1995 as an approach to solving community-related problems and social issues, including the use of AI. The aim is to facilitate an exchange of knowledge between various important interest groups that have different perspectives on a topic [17].

II. METHODS

In preparation for the World Café, a presentation entitled “Introduction to Artificial Intelligence - AI in the Transformation of the Textile Industry” is held to introduce the participants to the topic. From this presentation, the definition of digital business models was narrowed down and the current challenges in the ongoing digital transformation of the textile industry were discussed in more detail. Particularly interested listeners and those with a high level of expertise in the field then had the opportunity to take part in the World Café. The participants were distributed across several tables, divided into groups of five to six people. The distribution of participants was randomised in order to achieve maximum synergy in the discussion. The participants were not forced to give an answer in every round.

A total of three World Café sessions with 33 participants were held on the following topics:

- World Café 1: Current Status of Digital Business Models
- World Café 2: The Future of Digital Business Models
- World Café 3: Framework Conditions for Digital Business Models

The procedure for all three rounds was defined as follows. First, several questions were presented, each with a number of possible answers. It was also possible to give more than one answer at a time. This phase was mainly used to find out the individual opinion of the participants or the current status of their companies on the respective topic. This was followed by a final question, which was discussed in the groups. The questions were specific to each round:

- World Café 1: What are the biggest obstacles to scaling your digital business models (in all business areas)?
- World Café 2: Which established digital business models are relevant to you and might gain even more importance in the future?
- World Café 3: What specific data is required for the development and operation of digital business models?

At the end of the discussion, the results and different opinions of the participants were presented by a group spokesperson. Throughout the entire process, the participants were provided with technical and specialist support from research assistants who were supposed to clearify any ambiguities and ensure that the results were comparable.

A key aspect of the evaluation is the characterisation of the World Café participants. For this purpose, data on the location of the company headquarters were collected. Each year, the World Trade Organisation (WTO) publishes statistics on the origin of the main textile exporting countries, which should coincide with the surveys in order for the results to be useful. According to the WTO, China is the largest exporter of textiles with an export volume of $134.34 billion and, together with the other Asian countries, accounts for more than 50% of world trade. Europe and Turkey together make up the second most important group of countries with around $90 billion. (World Trade Organization, WTO Stats: Merchandise Trade, 2025, https://stats.wto.org/)

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As shown in figures 1 and 2, the participants were diverse, so that the perspectives of a wide range of companies were included in the results. This means that large, small and medium-sized companies are equally represented, as well as covering different parts of the industry.

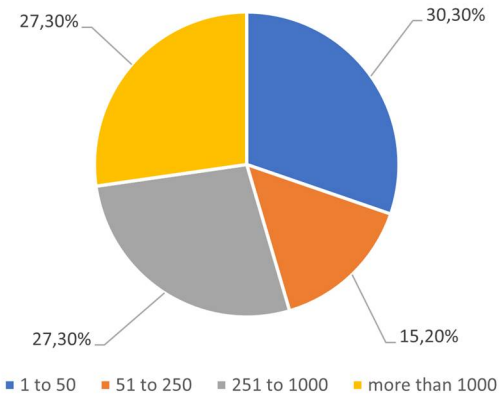


Fig. 1: Number of employees

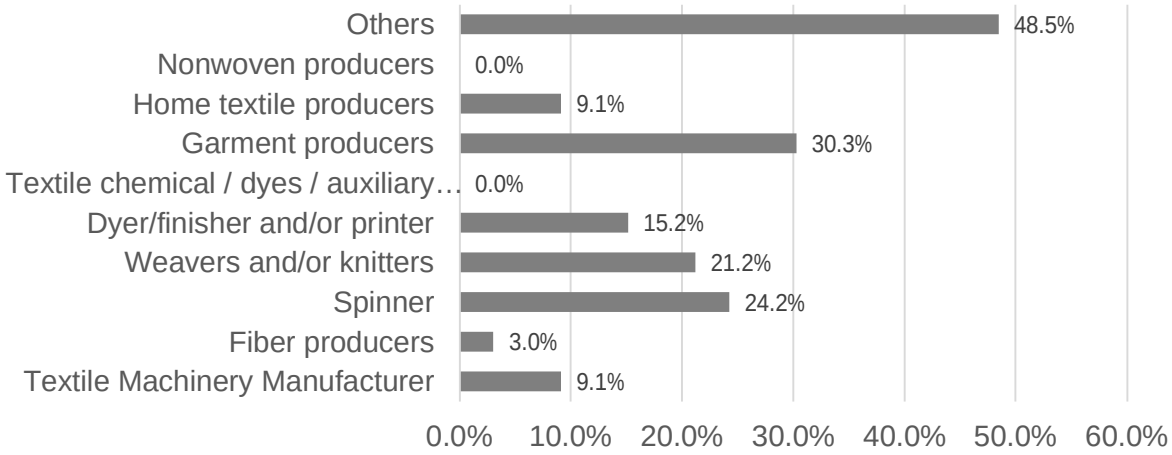


Fig. 2: Participant's businesses within the textile value chain

In order to be able to evaluate the votes cast, the participants were first asked about their individual knowledge of DBMs. They rated themselves in terms of their knowledge of the functionality and advantages of certain specified models. Nearly a quarter (27,3%) stated that they were not well versed in any model. Complementary to this, the best-known models to the participants with expertise in DBM were subscription models to data, settings or experts (45.5 %) as well as e-commerce platforms (39.4 %) and IoT connection (30.3 %).

III. RESULTS

This chapter answers the actual questions about current and future developments from the perspective of industry and research. To this end, the results are presented one after the other on the basis of the three world café rounds.

A. Current Status of Digital Business Models

Although 81.8% of respondents indicated that digitalisation is important or very important to their business strategy, less than a quarter of them (24,3 %) are satisfied with the profitability of their current model. This can be explained by the fact that, despite the obvious importance of digital business models, implementation is still at an early stage for the majority of companies. This phenomenon is independent of company size.

Technical implementation was identified as the biggest challenge. This can be made more difficult either by the complexity of the implementation or by the lack of qualified personnel. Digitalization has not progressed sufficiently and that companies are willing to change. However, they lack the technical and human resources to implement DBM.

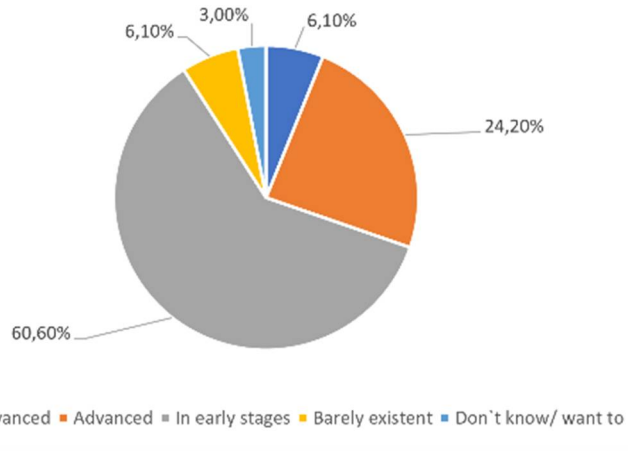


fig. 3: Progress in implementing DBMs

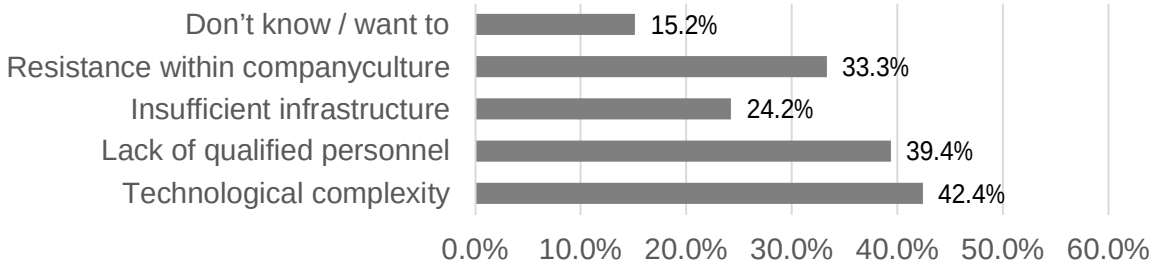


Fig. 4: Obstacles for implementing DBM

Based on this observation, a first thesis is derived in this paper:

Thesis 1: “The use of digital business models is widely insufficient and the main reason for this is the difficulty of technical implementation”

After the questions had been answered individually, a discussion took place in the respective groups about the greatest obstacles to the expansion and scaling of existing and implemented DBM. The results were presented to the plenum by designated group spokespersons.

Due to the above-mentioned distribution of companies along the entire production chain and the different geographical origins, the answers were correspondingly diverse. However, three major thematic blocks were mentioned or confirmed by all groups. One of the main problems identified was the integration and expansion of DBM within existing processes. The driving factor behind this observation is the acceptance of these new DBMs by the workforce. On the one hand, older employees and those with a low level of expertise in the use of new IT technologies tend to be sceptical about changes to long-established processes. On the other hand, a lack of information and involvement of employees in the decision-making process for new DBM leads to concerns about job loss or major and lasting changes to the working environment and conditions. This observation is also consistent with previous findings from labour science studies. [19]

Another obstacle is the general level of digitalisation in companies. The creation and expansion of DBM requires large amounts of data that cannot be captured manually due to their number and complexity. As a result, the implementation of DBM is extremely complex and uneconomical for processes that are largely not digitised and recorded in a standardised manner. The globalised textile industry in particular, with its high degree of manual work and production in low-wage countries, usually does not have a high degree of digitalisation at these production sites.

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In this World Café round it became clear that the majority of companies in the textile industry feel compelled by current developments in digitalisation as well as increasing political pressure, such as the introduction of the Digital Product Passport by the EU, to break new ground with regard to the introduction of new DBM. This general willingness to change is countered by outdated, entrenched processes in low-wage countries, particularly in textile technology, which, combined with ever-shrinking margins, make it difficult for the apparel industry to initiate change.

B. The future of digital business models

In the first round, the need for the introduction of DBM and the obstacles encountered were discussed. According to thesis 1, it is clear that there is a need for further development of digital business models in the future. A further World Café round will clarify how these models should be designed.

First, the relevance of DBMs in the future development of the company is clarified. 71.9% of respondents consider the introduction of a new model to be probable or very probable in the next 5 years. Despite the various options for implementing such digital models, Artificial intelligence was named as the most relevant technology.

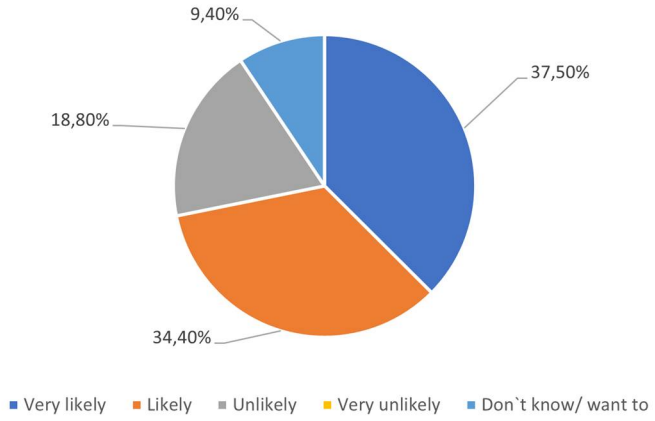


Fig. 5: Probability of introduction of a new DBM

The answers must be seen in the context of the participants' interests. It can be assumed that the values in figure 5 are particularly high due to their affinity for digital topics, especially the implementation of DBM. This characterisation of the participants can be derived from their willingness to be part of the World Café.

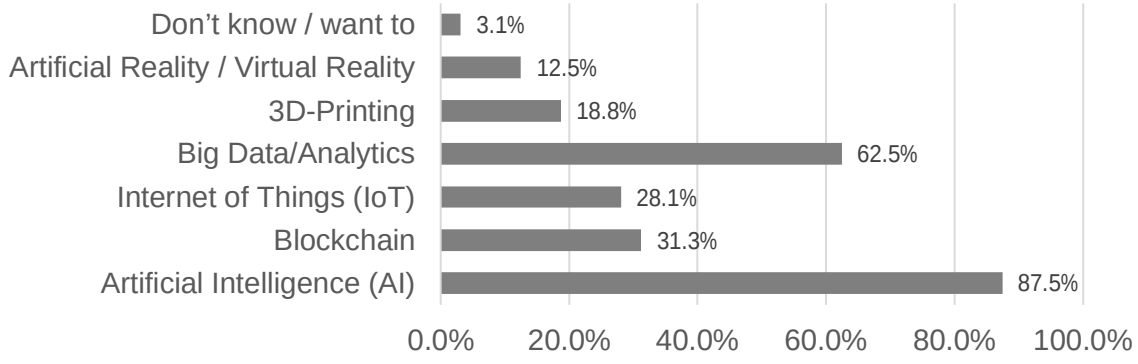


Fig. 6: Most relevant technologies for the future of DBMs

This decision for Artificial Intelligence as the most relevant technology for future DBM might be explained by its versatile applicability along the entire value chain, as both administrative and production processes can be supported by AI. In addition, many people have already come into contact with the topic of AI through media coverage and publications and have acquired basic knowledge.

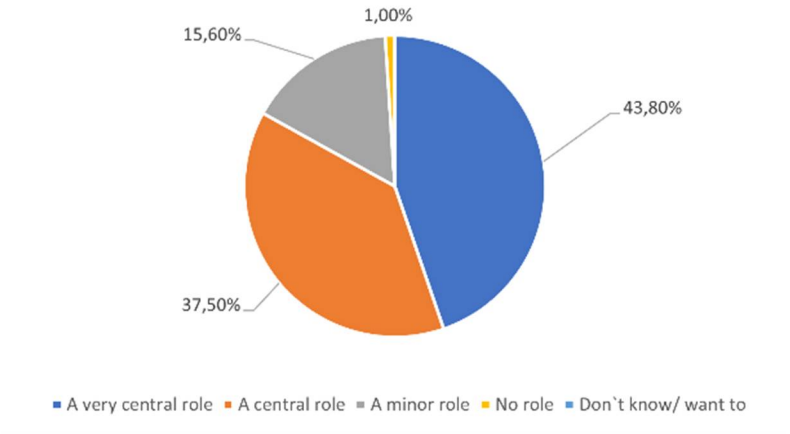


Fig. 7: Role of sustainability in future DBM

In addition to the relevant technologies, this session also clarified what role sustainability should play in digital business models in the future. 81.3% believe that sustainability should play a central or very central role in implementation. A further thesis can be derived from these findings.

Thesis 2: "In the future, the use of AI will play an even more important role along the value chain. This is to be developed not only for financial reasons but also for reasons of sustainability."

Similar to the first round, the discussion groups will discuss which DBMs are currently relevant and which could become more important for the textile industry in the future. The question was posed in an open-ended manner. However, the previous questions and the presentation presented the following models to stimulate discussion:

- Subscription model to data, settings or experts
- Freemium
- Data monetization
- E-Commerce platform
- IoT Connection
- Crowdsourcing
- On-demand service
- Remote services via artificial reality / virtual reality

As could already be seen from the previous questions, the DBMs based on the application of AI and the analysis of big data are the most important for the textile industry and are therefore, according to the participants, the most relevant for future developments. This is also due to the fact that increasing political pressure (see DPP) has created a need to connect the fragmented value chain of clothing production with each other through common data intersections. The production data obtained in this way can be analysed using big data applications and will be used by AI technology to allow monetary exploitation.

Due to the obstacles outlined in the first World Cafe round, the DBMs to date are primarily of a simple nature, meaning they were easy to implement. These include e-commerce platforms and on-demand services, which have long been among the favored methods in other industries as well. In companies that are mainly located in high-wage countries, IoT connections were also implemented in production. This is mainly due to the fact that standardization in this area is already well advanced and there are generic solutions for industry. The implementation of AI and Big Data applications, on the other hand, is still largely individual.

C. Framework Conditions for Digital Business Models

The results of the two World Cafe rounds so far have shown that the shift towards the more intense use of digital business models will continue to intensify in the future. This trend will be characterized above all by the use of increasingly complex technologies, which have so far been slowed down by the obstacles already mentioned in round one. The third round should therefore clarify the extent to which the basic infrastructure of companies allows for this change.

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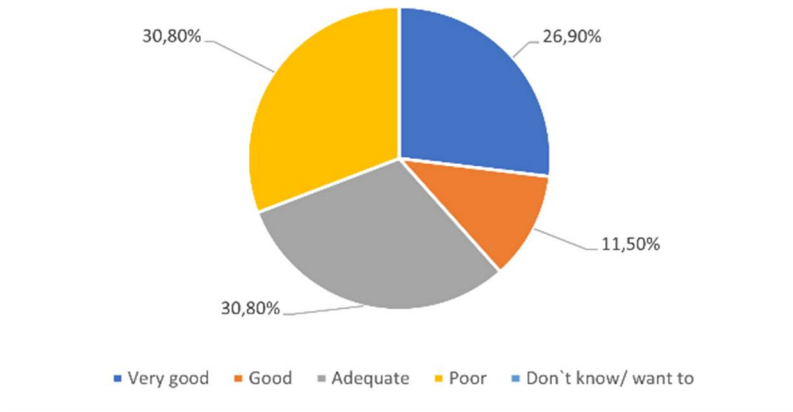


Fig. 8: Current infrastructure for supporting DBM

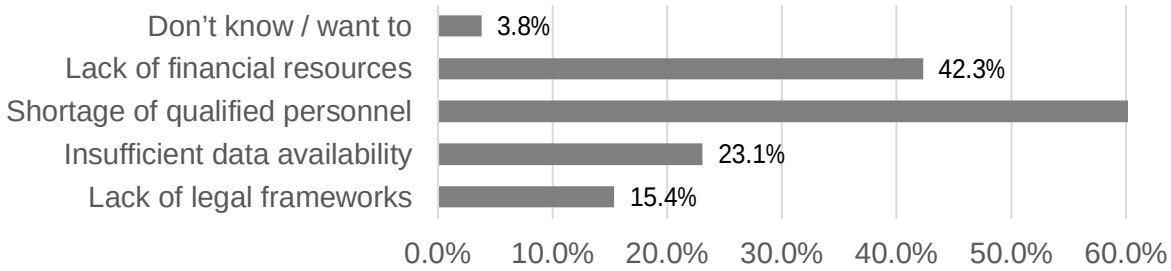


Fig 9: Greatest obstacles to developing DBM

As can be seen in figure 8, the participants' assessment of their companies' infrastructure in terms of supporting digital business models varies widely, with 30.8% still considering themselves to be poorly prepared. Similar to chapter 3.1, a lack of qualified personnel was identified as the biggest bottleneck for further development, as depicted in figure 9. For this question the participants had the possibility to give several answers. The financial aspects of the further development of digital business models were also identified as a further obstacle to rapid progress.

To overcome these obstacles, companies see an increased need for collaboration with external partners to develop and implement digital business models as depicted in figure 10. These external partners can be start-ups, tech companies or universities. In combination with financial support from public authorities, this can lead to sustainable growth for companies in the digital world.

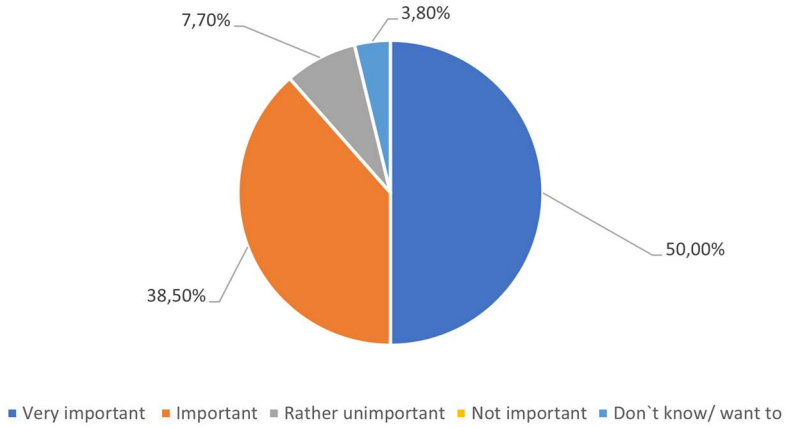


Fig. 10: Importance of collaboration with external partners (e.g., universities, startups) for the development of DBM

Based on these considerations and answers, a further thesis can be derived that describes the future design of AI-based DBM.

Thesis 3: "A large proportion of companies already have the technical infrastructure to implement digital business models. However, there is a lack of qualified personnel, which is to be procured through cooperation with external partners."

The subsequent discussion in the various groups focussed on the question of the specific data required for the development and operation of DBM. The answers suggest that this data can be divided into external and internal data. External data includes data about customers, such as personal information, consumer and purchasing behaviour, interests and level of education. This data can also include data about the market and the textile industry in general. This includes current trends and economic analyses of customers as a whole. The internal data that needs to be collected primarily includes the process data of the process that is to be supported by the introduction of a DBM. In addition, the individual competences of employees in the digital space are relevant in order to achieve the highest possible level of acceptance among the workforce.

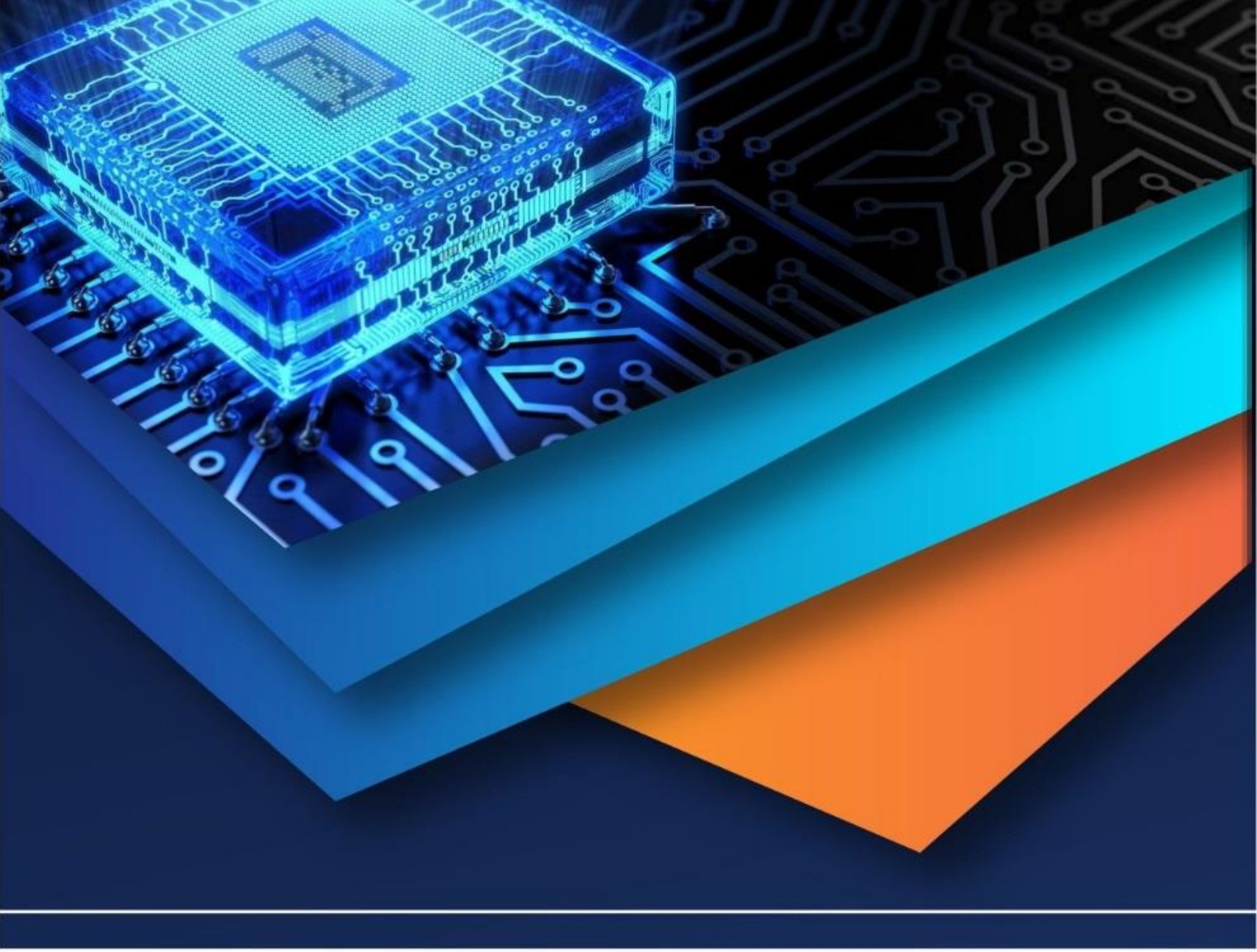
IV. CONCLUSION

The importance of implementing digital business models was recognised along the entire textile process chain, regardless of the size of the company. Accordingly, there is great interest in solutions for implementing these models, which allow companies to realise the digital transformation in a timely manner. In this context, companies' own use of digital business models is perceived as largely inadequate. This discrepancy between reality and their own aspirations can essentially be explained by the lack of qualified personnel and sufficient margins. In addition to these grievances, there are also problems that are specific to the textile industry. Due to the highly fragmented production landscape and the preference for low-wage countries for the construction of factories, the level of digitalisation of textile companies is behind that of other sectors. As a result, many companies do not yet have the necessary digital infrastructure to introduce DBM efficiently. This has created an investment backlog that must first be cleared so that these companies can catch up with current developments. According to a survey in the third World Cafe round, 69.2% of respondents therefore believe that most investments need to be made in technological infrastructure and personnel development in order to enable the implementation of digital business models in textile technology. The future of these models is diverse, but the application in the context of AI and big data is seen as the most important fields. This is largely due to their versatility and media coverage. In addition to the obvious financial motivation to promote the development of new digital technologies, sustainability aspects will also be important for future developments. These developments will be driven forward primarily in cooperation with research institutes and start-ups, as they are in a position to provide the necessary qualified personnel. The World Cafè method has delivered clear and valuable results that allow a variety of conclusions to be drawn. This paper therefore provides a solid basis for collecting further data in this format in the future. On the one hand, the temporal course of the responses can be mapped through the exact repetition of the World Café. This allows trends in this volatile subject area to be scientifically recorded. In addition, participants can be selected more specifically in future. In particular, those responsible for the implementation of DBM and its users could be asked specific questions.

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