Journal of Current Research in Engineering and Science
Bi-Annual Online Journal (ISSN : 2581 - 611X)

Volume 5- Issue 1, Paper 27 January 2022

AUGMENTED ANALYTICS: A REVIEW OF CURRENT TRENDS AND FUTURE CHALLENGES

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I. INTRODUCTION

We've gone from dealing with a few hundred to tens of thousands of unstructured and semi-structured datasets. The internet of things, cloud computing, and social software are all based on Big Data. Businesses are increasingly collecting structured and unstructured data. Despite the massive amount of data and its continual increase, much more can be done. Traditional BI solutions can't handle the volume of unstructured data. Since enormous amounts of data from many sources are required to gain crucial insights, Data Science offers a variety of Data Analytics methodologies.

Big data analytics is a way of uncovering hidden patterns and relationships that might help you make better decisions. The sheer volume, pace, and diversity of data generated daily need novel analytic methodologies. The field's most recent breakthrough is augmented analytics. This involves machine learning and natural language processing as part of incorporating AI into conventional analytics. Unlike conventional analytics or BI tools, these AI solutions continuously improve outcomes and learn from their experiences. Incorporating augmented analytics into data science workflows allows data scientists to evaluate massive amounts of data more efficiently, removing human error and even anticipating bias.

In addition to helping business users and executives make data-driven choices without the support of data scientists or IT specialists, augmented analytics may provide impartial prescriptive guidance on what to do next. The BI solutions industry is a tremendously dynamic field, and we expect edge computing and NLP to revolutionize future BI systems.

II. CURRENT STATE OF WORK / LITERATURE REVIEW

Augmented analytics is defined by Stephen J. Andriole [1] as "analytics," which defines the most feasible and effective automation. Discovering and communicating patterns in data is the goal of analytics. Raw data must be transformed into information that can be used to make more informed judgments. The foundation for augmented analytics is already in place, and it can be classified as one of four ways: description, explanation, prediction, or prescription. Initially, one of these areas should be targeted.

Matteo Francia [2] DISI – University of Bologna, Italy proposing A-BI+ (Augmented Business Intelligence) that, based on the sensed augmented context (provided by wearable and smart devices), proposes a set of relevant analytical queries to the user. This is done by relying on a mapping between the objects that can be recognized by the devices and the elements of the enterprise multidimensional cubes, and also by taking into account the queries preferred by users during previous interactions that occurred in similar contexts. A set of experimental tests evaluates the proposed approach in terms of efficiency, effectiveness, and user satisfaction.

Alexandros Bousdekis [3] National Technical University of Athens Greece outlined a framework for implementing quality analytics for decision augmentation through optimized human-AI interaction. Approach aims to reduce the number of quality issues through fast, mobile, and easy access to quality predictions for products and processes. An application case is the production of white goods is presented.

Francia, Matteo [4] and others proposed an approach that, based on the sensed augmented context (provided by wearable and smart devices), proposes a set of relevant analytical queries to the user. This is done by relying on a mapping between the entities that can be recognized by the devices and the elements of the enterprise data, and also taking into account the queries preferred by users during previous interactions that occurred in similar contexts. A set of experimental tests evaluates the proposed approach in terms of efficiency and effectiveness.

Anasse Bari [5] of New York University, present a first step towards building an artificial intelligence (AI) framework, with predictive analytics (PA) capabilities to explore the clinical spectrum of illness and predictive indicators in a case series from Wenzhou, Zhejiang, China. A clear limitation of this study is the size of the dataset. Further refinement of these models with more data, from different settings with different spectrums of severity, would strengthen the predictive power of the model and allow it to be a useful tool in identifying early from the many with COVID-19, who will develop more serious disease and require closer clinical attention and resources including early initiation of treatments, which will likely be in limited supply, if available in the future.

The University of Arizona's Hsinchun Chen [6] proposes a framework for BI&A's evolution, applications, and new study topics. Definitions and descriptions of BI&A versions 1, 2, and 3 are provided in terms of their most distinguishing features and capabilities. Analyzes current BI&A research and identifies obstacles and potential in the field's future. Even as BI&A 2.0 continues to mature, we find ourselves on the verge of BI&A 3.0, with all the uncertainties that new and potentially revolutionary technologies bring.

Rakesh Rana [7] of University of Skovde Sweden argued for the position that unstructured text provides a rich source of data that can be used for forecasting emerging technologies. A framework is developed to leverage the capabilities of text analytics techniques to augment methods used for technology forecasting. To acquire deeper insights and be able to make better inferences and forecasts at early stages of emerging technologies, one needs to use more richer source of information, i.e. unstructured text.

Girish Madhav Akurathi [8] of Bournemouth University, United Kingdom mainly focused on the convergence of the big data and the augmented analytics technologies to broaden the outlook by breeding the new applications for simplifying the highly fragmented data into simple statements which can easily be understood by the customers or users. The factors which improved the convergence also contributed to the challenges which were not experienced before by either of the technologies. The analysis of the large amount of data takes long due to the highly fragmented data. The challenge therefore comes when the augmented devices are in conflict with the increasing density of the big data.

III. ANALYTICS EPOCHS

Tools for data administration, analysis, and reporting coexisted alongside descriptive analytics in Analytics 1.0. (BI). Rather than sophisticated predictive skills or extensive statistical findings, business analytics was mostly used for internal decision support throughout this decades-long era. The bulk of analytical work was "artisanal," requiring high labour intensity and lengthy completion times.

Analytics 2.0 arose from the rise of data scientists and new data engagement platforms (like Hadoop). Patil & Davis (2012). Internal decision support has been prioritized over customer consumption of data and analytics "data products." Online retailers have benefited from "people you may know" technologies. Machine learning for search and ad targeting was introduced about this period.

Data Economy Analytics 3.0, where traditional industries adopt big data and analytics. Business structures and cultures must be transformed in order to use analytics 3.0. There are already hundreds of machine-learning models in use in data analytics solutions.

We are now in Analytics 4.0, the age of AI. Analytics 4.0 is the next level of complexity in the age of AI and cognitive technology. In 2016, and 2017, it was used by 20-30% of major businesses, depending on their location. Machine learning, especially automated machine learning, and artificial intelligence (AI) technologies are becoming more important.

IV. DATA ANALYTICS

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Analytics is a scientific method for identifying and communicating the patterns that can be found in large amounts of data. For making better decisions, it is concerned with transforming raw data into information In order to measure and acquire insight into the meanings of data; analytics use statistical methods, computer programming, operations research, and other mathematical techniques. When dealing with a large amount of data, it's very beneficial to use a database.

Big data analytics have become vital for everything from analyzing sales patterns to segmenting customers based on their online behavior to projecting how much inventory to hold. Yes, data is a valuable resource in and of itself, but it is through the use of analytics that data becomes useful. This applies not only to the corporate world, but also to the fields of sports, medicine, engineering, and any other activity using enormous volumes of data. "The steps of Data Analytics are Ingestion (Data Collection), Process (Data into Information), and Analyze (Information into Insight)".[9]

To collect data, a number of processes must be performed, including defining the group from which data will be gathered, the collecting technique, and the storage location. The next step is to organize the data by categorizing and quantitatively sorting it. Pre-processing, the third phase, is crucial for reliable study results. Pre-processing removes duplicate data, fills in gaps through imputation, and normalizes data as needed. The procedure continues with data mining and visualization. Descriptive, diagnostic, predictive, and prescriptive data analysis are the four major types and Currently, it is being expanded to include Augmented Analysis.

V. AUGMENTED ANALYTICS

Computer scientists who specialize in artificial intelligence (AI) construct automated systems that can accomplish activities that would ordinarily necessitate human cognition. Computer vision, natural language processing, and neural networks are just a few examples of the many technologies that fall under the umbrella of artificial intelligence. AI encompasses a wide range of technologies, including machine learning. In this way, systems are able to learn from their own experiences. Furthermore, computer systems don't require human intervention in order to foresee every possible scenario; rather, they learn and improve over time by analyzing their own experiences with that information, as well as the information they receive from their sensors. Marketers are mostly using machine learning and analytics to better serve their customers.

The use of machine learning and artificial intelligence (AI) with analytics results in improved analytics. By using ML and natural language processing, augmented analytics automates data insight and facilitates data sharing. Automated analytics is a technology that enables users to pick, prepare, and communicate data in a more efficient manner. It is subdivided into three sections.

- **Augmented Data Preparation** - In order to complete the data preparation process, machine learning is used to add missing values, identify leaks, and extract time series characteristics.
- **Augmented Data Science and ML** - It uses machine learning to automate essential components of analytic modelling. There is less need for a team of experts to create models that can be operationalized and managed.
- **Augmented Data Discovery** - Machine learning is used in Augmented Data Discovery to enable the discovery, visualization, and narration of ideas and results without the need for manual model development or algorithm coding.

VI. AUGMENTED ANALYTICS FEATURES

- **Recommend, prepare, and enrich data -** An augmented analytics solution recommends which datasets should be analyzed, notifies users when those datasets are updated, and suggests new datasets if the results aren't what the user expected. Charts and visuals can be created instantly. In this way, it is easier to grasp and share results in order to make quick business decisions.
- **Natural language interfaces -** Natural language queries, speech-to-text capabilities, and results provided in ordinary business language are all possible thanks to this feature.
- **Automated analytics**- It's also termed "automatic business monitoring," and it allows for continuous analysis to occur without the user's intervention. The laborious data discovery process can be automated and significant changes in data can be promptly surfaced (example – trend change), greatly speeding up the time to insight. For huge datasets with high dimensionality, this type of augmented analytics is extremely useful.

- **Natural language generation (NLG) and natural language processing (NLP) -** In today's current BI platforms, the use of natural language has become commonplace. To make difficult information more accessible and less scary, it automatically provides comprehensive explanations of insights identified in your data. Additionally, these technologies may have the ability to read and interpret text or voice, allowing the user to better interact with data through a more natural interface.
- **Machine assisted insights -** Visualizations and calculations can be generated by a computer, and variance analysis is commonly initiated by user questions. Users can click on specific points on a graph to learn more about or compare the time period represented by those points, such as a spike in the data. Using machine assisted insight, any charts may be automatically analysed, calculated, and built. A dashboard filter or a new query can be used in the past to undertake this type of deeper analysis, assuming one was available.

VII. Key Capabilities of Augmented Analytics

Advances in artificial intelligence (AI) technology will allow non-technical individuals to perform more meaningful data analysis. With the advancement of ML, DL, and NLP, users will be able to analyse and report on larger volumes of data at a faster rate. Non-technical users will be able to take advantage of AI-enhanced BI and analytics, which will make the software not only easier to use, but also smarter and faster. Augmented analytics improve corporate intelligence operations in numerous ways, from automation to contextual insight suggestions and conversational analytics.

Task automation: Data preparation, analysis, and visualization can all benefit from AI's ability to automate repetitive operations. Data can be cleaned and prepared using machine learning, patterns found and relationships generated by auto-generation of code are suggested, insights are generated and visualizations created.
Context-aware insight suggestions: Insights created by analytics that take into consideration user intent and behaviour are contextually aware and highly relevant. Based on the user's inquiries, the computer proposes new data views and hidden insights.
Conversational analytics: Users of any skill level can quickly and easily find insights using conversational analytics by asking questions and receiving responses in natural language. Data fields linked to what the user is looking for are shown as they type or speak. There are algorithms in place to provide consumers with useful information whenever they ask a query.

VIII. Augmented Analytics Advantages

The use of augmented analytics can speed up, streamline, and improve the accuracy of analysts' work. In addition, by reducing technological obstacles to data analysis and making more advanced techniques available to those with less mature data skills and expertise, machine learning and natural language technologies allow domain experts—people entrenched in the business—get closer to their data.

- **Agility: Increasing speed to insight -** AI-powered augmentation can speed up the hunt for insights by reducing the search space, revealing important data to the right person at the right time, and recommending profitable avenues for study. Systems can provide smarter defaults and recommendations, and tune and personalise them over time based on how people respond, by broadly tracking their behaviours. Quicker answers to data inquiries free more time for more strategic endeavors and less time spent sifting through mountains of data.
- **Accuracy: Providing a more complete picture -**Due to the fact that machines don't sleep, they are incredibly efficient at doing a wide range of repeated operations and calculations. AI and ML technologies in augmented analytics can successfully search into every nook and cranny so the user may make the most educated selections possible. Humans avoid confirmation bias when they have a thorough picture of the situation.
- **Efficiency: Automating operational tasks -** In applications where algorithms are fed by highly specialised, repetitive activities, machine learning and artificial intelligence have made remarkable progress. As an example, think of websites offering "you may also be interested in..." recommendations for related information or goods. People can

save time and energy by using task automation in augmented analytics, which includes data preparation, data finding, statistical analysis, and more.

- **Confidence: Powerful analysis in context -** Because augmented technologies are often simple to use, they make data analysis and insight more accessible to a larger audience. Augmented technologies can model and surface facts in context, allowing you to trust your intuition and your judgments. While business users may not fully grasp analytical concepts, they are experts in their fields or industries and can use this knowledge to augmented analytics results. These tools and software enable users to swiftly investigate their unique question without disrupting their analysis—and in some situations; no additional steps to prepare the data are required.
- **Increase data literacy-** As organisations continue to amass massive amounts of data, it is vital that everyone, regardless of analytical ability, be able to take use of it. Insights, recommendations, and empowerment from AI analytics can help consumers become more data literate. Creating a data literate workforce becomes much easier when the ability to search for and show insights in natural language is made available to the public.
- **Reduced Analytical bias-** Allowing the machine to analyse can help reduce analytical bias. If you don't know what you're looking for, you guess. Those assumptions are often backed up by statistics. Augmented analytics reduces potential bias by analysing a larger range of data and focusing on statistical significance. However, bias can affect the machine.
- **Increases trust-** In every data interaction, users provide machine learning algorithms information about their roles, skill sets, business environment, and intentions. Algorithms improve their relevancy and accuracy through time, improving user trust in data. The analytical process involves individuals, rather than just accepting discoveries.
- **Democratizing Insights and Empowering Business Users -** With prebuilt models and algorithms, firms may use augmented analytics without a data scientist. This is one of the main distinctions between augmented and standard analytics. Augmented analytics incorporates AI and machine learning. The complicated model building and statistic crunching continues, but in the background, to help users make better judgments. NLG automates the process of converting complicated data into text with intelligent suggestions, speeding up analytical discoveries.

  These models are straightforward to use and understand, allowing business users and executives to access tools rapidly. To optimise the time it takes from data to insights to decisions, anyone can use automated data enrichment and visualization recommendations. According to the BARC's 2018 Business Intelligence Survey, augmented analytics will completely revolutionise the user experience, alleviating many firms' data scientist shortages. NLP also helps non-expert users make sense of vast amounts of data. The software will discover and query the necessary data, and make the results easy to digest using visualization tools or natural language output.

IX. DISCUSSION - HOW IS AUGMENTED ANALYTICS USED IN ORGANIZATIONS TODAY?

Here are just a few real-world examples of how industries use augmented analytics:

Retail

You can utilize augmented analytics in the retail business to automatically evaluate customer data and find trends. You can make better decisions about product assortment, price, and promotions if you can forecast what clients are likely to buy..

Manufacturing

Managers employ augmented analytics to identify faults and optimise output in manufacturing. Imagine a factory where you can track every manufacturing line, every worker's production, and even every machine's power usage. Imagine real-time dashboards identifying bottlenecks or waste.

There's a lot of room for saving money with Augmented Analytics. Toyota, Apple, and Airbus are all big users of these tools. Coca-Cola used AI and Big Data to make better product, brand, and supply chain decisions. The corporation has tracked who posts photographs of its items (and competitors) on social media using AI image recognition. Coca-Cola then generates targeted advertising to reach them.

Healthcare

Doctors and management can utilize augmented analytics to evaluate patient data, detect trends, and enhance medical care. Healthcare in particular could benefit from better comprehending medical information and making data-driven decisions. Augmented Analytics can help hospitals.

Almost one in four persons who are hospitalized are readmitted within 30 days. That's why more hospitals are turning to AI-powered analytics to reduce readmissions. In fact, a recent study indicated that augmented analytics does help minimise readmissions at a Mayo Clinic hospital in Wisconsin.

Financial Services

From chatbots to growth models, almost every bank uses AI. For example, JPMorgan Chase & Co. is a leader in augmented analytics usage. Many banks previously targeted elderly clientele for wealth management services, but they noticed a knowledge gap. In order to find out who was most likely to participate, they employed augmented analytics to automate data analysis and ask deeper questions.

Emerging Opportunities has reduced costs and increased revenue while improving customer satisfaction. After Goldman Sachs, other banks including JPMorgan Chase have increased their implementation of augmented analytics in other sectors.

Agriculture

Farmers now have sensor-driven water management systems that alert them to overuse. AR helps farmers track water use, soil temperature, moisture content, crop status, and other farming tools.

For example, the agriculture industry used augmented analytics to identify the best hybrid seed combinations from a dataset of thousands, allowing non-technical people to take over the analysis process.

Marketers

Marketing executives, entrepreneurs, and others rely on analytics professionals for in-depth research, planning, and reporting. Marketers can use Akira AI for missing value imputation, target leakage detection, and time-series feature development. Marketing professionals may work more efficiently using enhanced analytics that are user-friendly. Marketers have more power with augmented analytics.

E-Commerce

Until recently, it was impossible to produce business insights and analyse data without human intervention. But now it is achievable with augmented analytics. Akira AI automatically selects algorithms, features, deploys models, and monitors deployed models to determine when models need to be refreshed. Using graphs, tables, and other graphics Augmented analytics visualises sales, inventory, and customer data to assist e-commerce businesses make better decisions. It creates unique and customised purchasing experiences. Customers and staff benefit from NLP since they may inquire in natural language and receive responses in the same format.

Insurance

Using Augmented Analytics and Akira AI predictive modelling, insurers can now better identify insurance fraud by connecting new claims to existing fraudulent claims. It will enable insurance claim inspectors to make data-driven decisions rather than relying on intuition to sort through hundreds of cases. Augmented Analytics can also automatically highlight suspected fraud scenarios for additional investigation. Finally, this method would clean up the insurance business and provide assistance to people in need.

X. Artificial Intelligence in Analytics: Limitations and Issues.

The reliance on input data is a fundamental AI analytics flaw (Underwood 2017). AI-powered automation does not replace rigorous data selection and human data preparation. Enriched analytics opens up data selection and preparation to more people."Biases in machine-learning algorithms can arise from data quality difficulties, as well as from biases in the data used to train them.[11] Thus, trust and openness are critical to augmented analytics' success. Transparency and explanation of model findings are difficult for some algorithms, such as neural networks. Some limitations of augmented analytics are tied to specific phases of the analytics cycle. Managers and business users identify company problems and opportunities. For example, ‘‘Improve high-value client retention in the tablet category", or ‘‘Prevent product shrinkage in the warehouse". While machines can solve issues, posing them is intrinsically human, Human judgment is still required in data preparation, for example, in interpreting outliers. Finally, automating operational decisions and activities is limited. Many decisions involve a sense of ethics, empathy, and other human-like abilities.

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The use of augmented analytics poses several questions about technologies, people, processes, and their interconnections. One difficulty is the redefining of jobs in the analytics cycle due to automation. In a more automated world, how should data scientists' roles change, and what are their most valuable duties beyond modelling?

The orchestration of the analytics process is another significant issue. Since this orchestration typically involves a wide range of stakeholders and a wide range of tools and IT environments, it is difficult. Artificial Intelligence (AI) automation has made it much more difficult to manage analytics because it has made it easier for everyone to access and use analytics. The fact that the analytics process is not entirely sequential and can be implemented in a variety of ways further complicates the orchestration and governance of the process.

XI. Future Directions and Challenges in Research

This new wave of disruption in data and analytics must be implemented to maintain a competitive advantage. But it takes the appropriate mix of strategy, people, process, data, and technology. Attempts to include it will undoubtedly face opposition as follows:

- **Accuracy and trustworthiness:** Ensure that the insights generated by your tools are correct and reliable. Using accurate data and updating models when your data changes are two ways to ensure that your models are up-to-date.
- **Relevance**: People don't have the time to go through a tones of garbage. Verify the accuracy of your information by running tests on it. Because if they don't, people would quit using the tools because they don't deliver any benefit.
- **Training data quality**: Training data quality: If you don't have the correct data to train analytical models, your insights will be of little value. In order to maintain a high level of insight quality, models should be maintained and updated.
- **Performance and scalability**: It is possible that augmented analytics will require a significant amount of computational power, depending on your platform and capabilities. Keeping in mind that the volume of data has a major impact on response time is also important.
- **Data bias**: Incomplete data sets and a lack of context are the most common causes of bias. If you want more objective outcomes, you'll want to include context in your algorithms.
- **Misconceptions of AI and ML**: There's still a lot of focus on the technology itself, rather than how people will use and benefit from it, because of the complexity of AI and machine learning. Misconceptions about robots stealing people's employment are one reason for this, but another is that solutions that benefit those who work with data may be delayed in their adoption. AI and augmented analytics won't be adopted by the public if they don't believe in their value.
- **Post Pandemic Issues** : Analysts are aware of their role in navigating COVID-19 data, despite job security worries. Hiring freezes and layoffs, on the other hand, limit the number of analysts available. This means that analysts are under increasing pressure to provide timely insights so that managers and leaders can take appropriate action.

In light of the aforementioned challenges and limitations, IS researchers should look at them. IS academics, for example, should study more comprehensive methods for assessing the authenticity of data. The term "veracity" encompasses a wide range of ideas. For textual information, objectivity, truthfulness, and credibility are three criteria Big data analytics relies heavily on data that is inherently uncertain (e.g., weather data, customer behaviour, etc). Decision-makers should be aware of the data's degree of validity even if it cannot be guaranteed to be 100 percent. Transparency and confidence in augmented analytics can both be improved with a comprehensive measure of accuracy. Governing data analytics, such as controlling the quality of data or orchestrating analytic processes, is another research focus.

Big data research in Information Systems (IS) is proposed by considering the interplay between the properties of big data, the information value chain, and the most common research methodologies in IS (behavioral, design, and economics of IS). Instead than focusing on the information value chain, we focus on the interactions between AI, the analytics cycle, and research approaches.

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XII. THE ROAD AHEAD

Despite the fact that augmented analytics is a relatively new technology for small businesses, large corporations have just begun to experiment with it. Because it can process and show enormous amounts of data, augmented analytics is the answer to handling tremendous amounts of data.

The most significant development in business intelligence (BI) over the last few years has been the inclusion of enhanced analytics capabilities. To help business customers query their data, vendors are making advances with natural language processing (NLP). Some have also incorporated anomaly detection tools. Augmented analytics has given decision-makers the ability to conduct in-depth analysis and complex modelling on their own, allowing them to gain actionable insight from their data on their own. Working remotely, when decision-makers must rely on their own judgment, this is extremely important. Enhanced analytics products will increasingly rely on advanced analytics features, such as:

- Predictive and prescriptive analytics enabled by embedded AI and Data Science Machine Learning (DSML) models.
- Live querying and self-service models run to construct, train and deploy data models with minimal expert involvement.
- User confidence in data quality, model stability, and insights interpretation should be explained in detail.

Data Storytelling at Scale- Data tales are usually the domain of analysts who are good observers of business trends and anomalies. With augmented analytics, businesses can now tell stories with data at scale, unearthing hidden insights and empowering machines to convey tales to humans.

With most augmented BI technologies, the goal is to build an actionable data story. Assuming most ABI technologies provide significant dash boarding capabilities, end-users must be able to extract and explore important data stories for augmented analytics to become widespread. What this means for augmented analytics products is that they must enable:

- Contextualized business summaries and visualizations.
- Explanations of analysis in a manner easily understood by business users to accept the machine-generated insights.
- The insights presentation platform for decision-makers with seamless cooperation and presentation (potentially replacing traditional presentation media).
- A data culture requires decision makers to be able to effortlessly query and understand what is occurring and why – not simply numbers. It is vital that business apps have built-in augmented analytics capabilities with automatic delivery of actionable suggestions that are easily embedded in their day-to-day workflows via application SDKs.
- As insights grow more prevalent across business systems, we may see decision-makers using mobile devices to interact with augmented analytics interfaces. Also, as voice help grows in popularity, users will gradually ask for information (similar to asking Alexa for weather updates). This may entail enhancing Natural Language Generation (NLG) technology with a business-specific conversational flavour.

Because the end user is always a business user, an open data-driven culture and intuitive user experience are crucial. Because most business users don't have coding or technology backgrounds, they may lack the skills to analyze data, which is why they've typically relied on analysts for all advanced analytics needs. As a result, the design philosophy must be centered on the business user to avoid lost insights.

Even the most well-designed augmented analytics systems may suffer usage and adoption challenges in the coming years. When building the end-user experience, product design teams will need to integrate gamification and extensive behavioral research. A clear approach to improve data literacy will be required to help them solve business problems.

XIII. CONCLUSION

It is impossible to deny the power of analytics in providing significant insight based on data in order to arrive at decisions based on facts. Scientific methods like as mathematics, statistics, machine learning, optimization, and simulation are used to identify relevant patterns and information in this area of study. Analytics is on the verge of a paradigm shift in which the entire process of data analysis is automated. Thus, a new trend known as "Augmented Analytics" emerges, in which AI is

incorporated into existing analytics frameworks. Businesses, academia, as well as data and analytics solution providers will need to come up with acceptable strategies for dealing with this new paradigm in the data and analytics industry.

Edge computing and natural language processing (NLP) have yet to be deployed by any of the OEMs, based on our findings. These aspects are important to us because they indicate the route that BI solutions going forward will take. Finally, the market for BI solutions is highly dynamic, and edge computing and NLP are likely to revolutionize future BI systems, which we plan to keep an eye on in our future work.

REFERENCES

[1] *Stephen J. Andriole, Thomas G. Labrecque Professor of Business Technology, Villanova School of Business, Villanova University "Artificial Intelligence, Machine Learning, and Augmented Analytics" Published: IT Professional (Volume: 21, Issue: 6), IEEE Nov.2019 (https://doi.org/10.1109/MITP.2019.2941668)*

[2] *Matteo Francia, Matteo Golfarelli, Stefano Rizzi DISI – University of Bologna, Italy "A-BI+ : A framework for Augmented Business Intelligence" Published in: Information Systems, (Volume 92, 101520), September 2020, Elsevier (https://doi.org/10.1016/j.is.2020.101520)*

[3] *Alexandros Bousdekis, Stefan Wellsandt, Enrica Bosani, Information Management Unit (IMU), National Technical University of Athens (NTUA), Athens, Greece "Human-AI Collaboration in Quality Control with Augmented Manufacturing Analytics" Conference paper Part of the IFIP Advances in Information and Communication Technology book series (IFIPAICT, volume 633) August 2021, Springer (https://doi.org/10.1007/978-3-030-85910-7_32)*

[4] *Francia, Matteo, Golfarelli, Matteo and Rizzi, Stefano University of Bologna, "Augmented Business Intelligence " Published in the Workshop Proceedings of the EDBT/ICDT 2019 Joint Conference, Portugal on CEUR-WS.org March 2019 (http://ceur-ws.org/Vol-2324/Paper02-MGolfarelli.pdf)*

[5] *Anasse Bari and others of New York University, "Towards an artificial intelligence framework for data-driven prediction of coronavirus clinical severity" Journal Computers, Materials & Continua 63.1 (2020): 537-551. (http://www.techscience.com/journal/cmc)*

[6] *Hsinchun Chen, University of Arizona and others. "Business Intelligence and Analytics: From Big Data to Big Impact" MIS Quarterly Vol. 36, No. 4 (December 2012), pp. 1165-1188 (24 pages) Published By: Management Information Systems Research Center, University of Minnesota. (https://doi.org/10.2307/41703503)*

[7] *Rakesh Rana, Alexander Karlsson, Goran Falkman School of Informatics, University of Skövde, Sweden "A framework for identifying and evaluating technologies of interest for effective business strategy: Using text analytics to augment technology forecasting" Published : 5th International Symposium on Computational and Business Intelligence, IEEE, August 2017 (https://ieeexplore.ieee.org/abstract/document/8053555)*

[8] *Girish Madhav Akurathi [10] of Bournemouth University, United Kingdom "BIG DATA & AUGMENTED ANALYTICS" published in Research Gate.*

[9] *Monika Mangla, Assistant Professor, Department of Computer Engineering at Lokmanya Tilak College of Engineering (LTCoE), Mumbai, India. "Integration of Cloud Computing with Internet of Things: Foundations, Analytics and Applications" Wiley Publisher ISBN: 978-1-119-76887-6 April 2021 (https://www.wiley.com/en-ae/Integration+of+Cloud+Computing+with+Internet+of+Things%3A+Foundations%2C+Analytics+and+Applications-p-9781119768876)*

[10] *Brynjolfsson, Erik, and A. N. D. R. E. W. Mcafee. "Artificial intelligence, for real" Harvard business review 1 (2017): 1-31. (https://starlab-alliance.com/wp-content/uploads/2017/09/AI-Article.pdf)*