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Using Artificial Intelligence (AI) to Study Business Value Creation Through AI: An Empirical Study

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USING ARTIFICIAL INTELLIGENCE (AI) TO STUDY BUSINESS VALUE CREATION THROUGH AI: AN EMPIRICAL STUDY

(Note: Please include this section below and leave the author information blank on initial submissions to facilitate blind review)

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ABSTRACT

Artificial Intelligence (AI) has been promising to create business value in the last few years like never before. Several studies are looking at how this variant of information technology can be leveraged. This study aims to synthesize the different modes of value creation using IT and extend it to AI. The contribution of the study is that it takes a novel approach of using AI technology, namely Topic Model-ling using Natural Language Processing (NLP) to study the usage of AI technologies in creating business value using empirical data from 110 organizations around the world that have used an AI plat-form to manage their business. The paper is a research in progress ad when completed aims to corroborate the findings provided by AI wit those done using traditional research methods.

Keywords

Artificial Intelligence, Text Analytics, Business Value, Natural Language Processing

INTRODUCTION

Information Technology has become an integral and indispensable part of the world of business and commerce. Given the highly complex nature of such technology involving different hardware and software platforms as well as distinct business requirements, they require substantial and continuous involvement, time and investments from the organizations that implement them. This brings us to the fundamental questions of business organizations -   'Is this all worth it?' or 'What is the value added?' Such value can be achieved through different ways: improving efficiency of opera-tions and cost savings thereof, innovative service, strategic positioning, improved decision making and so on (Smith and McKeen 2003). Artificial Intelligence (AI) has been promising to deliver decision-making ability to organizations for a decade now. While Artificial Intelligence (AI) is not some-thing new, it has gained much attention in recent years (Ransbotham et al., 2018). Artificial Intelligence can be defined as "the use of multiple technologies that enable computers to sense, comprehend, act, and learn, including techniques such as machine learning, natural language processing, knowledge representation, computational intelligence" (Stone et al 2020). It may be noted that, most decisions that AI make are at the operational level, eg: whether to offer a loan to an applicant, how much demand is predicted for a particular product or service. A recent study by MIT Sloan Management Review found that more than 80% of organizations see AI as a strategic opportunity, and almost 85% see AI as a way to achieve competitive advantage (Ransbotham et al., 2017). De-spite this, The application of AI for making more strategic decisions is still under-investigated in both academia and industry. This leads us to the research question

How can AI create business value for business organizations?

LITERATURE REVIEW

As discussed in the introduction, improving operations is one of the many means of creating business value; other means can be savings thereof, innovative service, strategic positioning, improved decision making and so on (Smith and McKeen 2003). The motivation for the study is to go beyond the operational benefits of Enterprise Systems and explore how these systems can enable business value beyond operational efficiency. Given that Enterprise Systems were initially developed to pro-vide operational efficiency, and are only recently being looked at for other ways of creating business value, there isn't much prior research in this area.   Therefore, studies on business value from IT in general were reviewed to identify the types or means of business value that IT can enable.

A detailed systematic review of literature was done to identify means (in addition to operational efficiency) in which IT, in general, can enable business value. Such a review is summarized in Table 1 below.

Study	Means of creating business value with IT
Sambamurthy and Zmud (1994)	New products and services Transformed business processes Enriched organizational intelligence
Mooney et al. (1996)	Automational Informational Transformational
Weill and Broadbent (1998)	Infrastructural Transactional Informational Strategic
Tallon et al. (2000)	Customer relations Suppliers relations Sales and marketing Production/operations Product/service enhancement Process planning and support
Applegate et al. (2003)	Assist auxiliary support Support core processes Support strategy of the firm Innovate
Sambamurthy et al. (2003)	Agility Digital options Entrepreneurial alertness
Kohli and Grover (2008)	Co-creating with partner organizations Embedding IT into processes Reassessing & making decisions by information analysis
Weill and Ross (2009)	Operational performance improvements Accelerated product/service innovation Reorganization around customer oriented processes Integration of mergers and acquisitions
Zhu et al.(2015)	Platform capability (technical components) Relational governance (relational components) E-Business process capabilities (business components)
Zott and Amit (2017)	Novelty Lock-in Complementarities Efficiency
Grover et al.(2018)	Efficiency Coordination Decision Making
Enholm et al.(2022)	Process Efficiency Insight generation Business Process Transformation

Table 1. Classification of studies done on the role of IT in creating business value.

A key variant of IT, Artificial Intelligence (AI) has been disrupting business for the last few years and bringing about new opportunities and business models. AI has started to be used by organizations in the operational and decision-making front like using chatbots for better customer experience and making predictions for bank loan default (Ransbotham et al 2017; Jarrahi 2018; Stone et al. 2020; Trunk et al 2020).

In this context it is important to understand that a business model is an activity system undertaken to meet the perceived needs of the market. Value creation happens through phenomenon such as novelty, lock-in, complementarities and efficiency (Zott and Amit 2017) .

A very comprehensive review was conducted and was themed under the three categories (1) the key enablers and inhibitors of AI adoption and use; (2) the typologies of AI use in the organizational setting; and (3) the first- and second-order effects of AI (Enholm et al. 2022). It has been found that AI enables organizations to optimize existing processes and improve automation, information and transformation effects, It is emphasised that such AI benefits in organizations, and more specifically its ability Business Process Management Journal to improve on performance at financial, marketing and administrative levels (Jarrahi 2018; Wamba-Taguimdje et al. 2020). It was found that AI substantially contributes to new product development and business process transformation (Mishra and Pani 2021). Automation, Decision support, marketing and innovation were identified as the key business value elements of AI in another study by Mikalef et al (2019).

Despite a number of studies on theoretical frameworks, there is a lack of studies on on real life organizations on how to create business value from AI. One of the few such studies did a comprehensive analysis of the top AI actual use cases across 7 industries to discover the key challenges of using AI (Alsheibani et al. 2020). This leads to a very interesting area to explore the role of Artificial Intelligence in creating business value.

METHODOLGY

Secondary data is data that is in existence already and was collected for a purpose other than the re-search project in question (Newman, 2003). Sources of secondary data include vendors, specialist agencies, industry-research based organisations such as Gartner and Forrester, archival sources and so on. Carefully chosen secondary data can form a useful empirical data source (Jarvenpaa, 1991; Ticehurst & Veal, 2000; Newman, 2003).

We utilised content analysis on the secondary data. Content analysis is a method for the objective, systematic and qualitative description of the manifest content of communication (Berelson, 1952; Krippendorf, 2004). Content analysis is a way of analysing documents with a view to classify, and sometimes, quantify, content in terms of "predetermined categories" and in a systematic and replicable manner (Bryman & Bell, 2003).

For the purpose of this research, we obtained user reports from a well-known vendor of AI and analytics systems, SAS. These contained information from CIOs and senior managers in organisations that have adopted their systems. These reports contain the contact details of the organisations, their top management members and quotes from interviews. This mitigates a number of concerns of possible biases in secondary data that may arise.

A sample of 110 cases of large firms worldwide operating in different industries was selected and matched the criteria described above. These reports provided information about the following aspects:

•   The organisation's background and business strategy.

•   Objectives of the adoption of ES.

•   Details of implementation, such as modules implemented, costs and timeline

•   Benefits realized with financial figures or examples.

•   Future roadmap.

An analysis of the content of these success stories combines some of the strengths of a survey and a case study. Being reasonably content-intensive, vendor-provided success stories afford some insight into each user organisation, as is possible with case

studies. In addition, the use of a large number of cases provides a means to obtain information across different industries in different parts of the world, as is done in a survey. Though not collected first-hand by the researcher, these multiple stories provide verifiable data for review and analysis.

Given that these user reports are presented for the purpose of marketing and the communication by the vendor, we recognize the risk of bias in the data. In particular, there can be concerns about the credibility of the data. However, such concerns are addressed in the following ways:

•   These user stories are from one of the most reputed vendor of AI systems (SAS) and are publicly available; hence, they bear little risk of being false.

•   These user stories contain the contact details of the organisations as well as their top management members with quotes from their interviews for verification.

Additionally, in the context of ES, Seddon et al. (2010) utilised similar secondary data as the sole means of empirically validating their research model.

As the purpose of the study is using AI to research AI, two most popular and widely used AI plat-forms are chosen (a) SAS Viya (b) Python with Jupyter Notebook.

A textual analysis was done on these 110 user stories was done first using Python with Jupyter Notebook and then subsequently but independently in the analytics software SAS Viya. For each of these two platforms, the data in the form of user stories was subjected to Natural Language Processing and subsequently Topic Modelling to understand the key themes that are underlying these user reports. The results of the findings are shown in the next section.

FINDINGS AND DISCUSSION

First, the results of the text analysis done using Python language in Jupyter notebook from the data is shown an explained below. The figure below shows the most relevant themes that came out of the text analysis from executing the code.
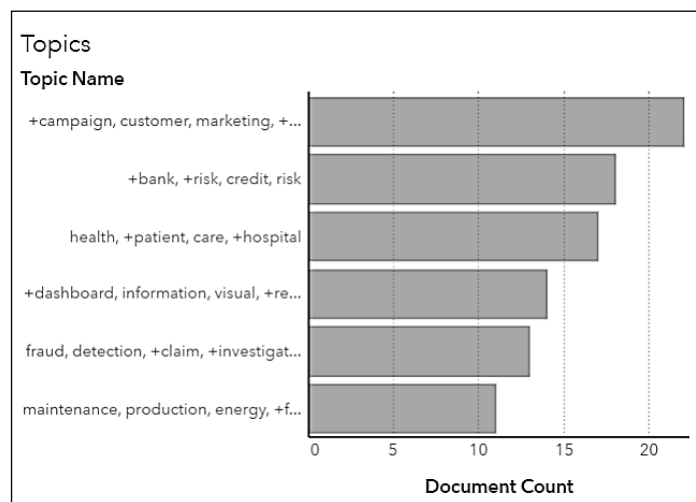

Figure 1. The themes emerging from the text analysis of the user stories using Python and SAS Viya

The results show the common themes are around bank, risk, fraud, marketing, health and others. To obtain a more sophisticated thematic analysis, SAS Viya was used to do the same task next.

Next, the results of the text analysis done using SAS Viya software from the data is shown an explained below. The figure below shows the most relevant themes that came out of the text analysis from the software.

The SAS viya software is sophisticated enough to incorporate synonym-matching for the words analysed as well as removal of the so- called 'stop-words' such as the one, time that do not add value.

The above figure shows the top 6 themes emerging from the text analysis of the user stories. It is found that the most frequent theme (with 22 user stories) was around customer marketing and campaign. This indicates the use of AI in the area of marketing campaigns. An analysis revealed that supervised machine learning techniques were used to predict which customers would respond to campaigns. Furthermore, unsupervised machine learning techniques like clustering were used to segment the market to target the market differentially, based on the segments.

The next most frequent theme (with just under 20 user stories) is around bank, risk and credit, indicating the use of AI in banking and risk profiling. An analysis revealed that predictive modeling techniques such as logistic regression methods were used to detect the probability of loan defaults; this helped in risk profiling of the candidates.

The next most frequent theme (with 17 user stories) is around health patient care and hospital, indicating the use of AI in healthcare and hospital treatment. Another important theme that emerged with 13 documents is that of fraud detection and investigation. Finally, production and maintenance were found to be another important theme with 11 user stories.

So, the results of the study concur that the key areas where AI can create business value are: Marketing campaigns, risk profiling in banks and financial sectors, hospital management and heath care, fraud detection and investigation and finally production and maintenance in factories. This is in line with the findings in literature on creating business value with AI.

CONCLUSION

This paper presented a review of how IT in general and how AI as a variant of IT can create business value for organizations. The contribution of the paper is a novel way of using 'AI to study AI', i.e. using an AI software to explore the business value creation in organizations using AI as a variant of Information Technology.

It was interesting to find that the most important value creation with AI seems to be in the area of marketing campaigns, which could be through use of supervised machine learning and customer segmentation using unsupervised machine learning. Also, the next most theme is risk profiling, again enabled through supervised machine learning techniques. It would be useful to study these two key themes as distinct studies to understand the phenomenon better.

The research will be extended to corroborate the findings that were obtained by AI to analyse the data with findings obtained by coding the data manually. The intention is also to improve the generalizability by undertaking detailed case studies, particularly I the two sub themes namely how AI creates business value for marketing campaigns and risk profiling.Also, the intention is to validate such findings through a survey. Furthermore, this study also lays the foundation for a study on the ethical considerations that need be explored that might arise as a by-product from the business value creation process by using Artificial intelligence

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