



Collana del Centro Universitario Studi Aziendali (CUSA)  
“Quaderni di Ricerca Economico-Aziendale: Teoria e Casi”  
coordinata da Marcantonio Ruisi (Università di Palermo)

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**QUADERNI DI RICERCA ECONOMICO-AZIENDALE: TEORIA E CASI**  
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La collana di quaderni di economia aziendale che qui presentiamo si offre quale opportunità per gli studiosi della disciplina di presentare alla comunità scientifica i risultati della propria attività di ricerca secondo una prospettiva — lato sensu — metodologica che in via complementare tenda prevalentemente ad affiancare alla riflessione teorica, l'evidenza empirica di specifici casi di studio. Le pagine dei quaderni, ancorché testimoni dello sforzo di ricerca degli autori, non offriranno necessariamente considerazioni compiute, piuttosto potranno anche presentarsi come prime conclusioni, o comunque come asserzioni meritevoli di ulteriore riflessione. Nella direzione di arricchire lo studio condotto e auspicabilmente di migliorarne i risultati, si è ritenuto opportuno concepire la collana secondo la logica del “canale aperto”, cioè di una possibile interlocuzione scientifica degli autori con i lettori del testo, i quali potranno con gli stessi confrontarsi utilizzando l'indirizzo di posta elettronica che verrà messo a loro disposizione.

Il nostro auspicio è quello che la collana possa rappresentare davvero un'occasione, soprattutto per i giovani studiosi, di sistematizzare i propri sforzi di ricerca avendo a disposizione un supporto che superi i limiti imposti dall'economia di spazio che una rivista o un volume di proceedings congressuali inevitabilmente comportano.

Nel ricordare che la responsabilità ultima dei contenuti di ogni lavoro ricade eminentemente sugli autori delle ricerche, si vuole manifestare la volontà di accogliere anche volumi collettanei, con contributi molteplici elaborati e proposti intorno ad un tema, ad ogni modo preferibilmente sviluppati secondo il sinergico connubio di speculazione teorica ed osservazione di campo.

*Ad maiora!*

*Marcantonio Ruisi*  
UNIVERSITÀ DEGLI STUDI DI PALERMO

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# **BIG DATA AND ACCOUNTING IN SUPPORTING DATA-DRIVEN PLANNING MODEL FOR MAKE-TO-ORDER (MTO) COMPANIES<sup>(1)</sup>**

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(1) The research monograph is the result of joint effort and formulation of the authors. However, Luca Ianni (corresponding author) wrote Introduction, Chapter 1; Chapter 2; Chapter 3 – paragraphs: 1, 2, 3, 5, 6, 7; Chapter 4. Gianluca Marullo wrote Chapter 3 – paragraphs: 4, 8.





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# INTRODUCTION

Big Data has had a major impact on the daily life of businesses and scientific research in general. This revolution has been driven by the huge growth of data in almost every sector of industry and business sector. The increasing development of the Web, the Internet of Things (IoT), and cloud computing (Jin et al., 2015) over time have also played a substantial role in the evolution of many activities supporting business decisions. According to Chong and Shi (2015), Big Data are collections of information characterized by complexity, diversity, heterogeneity, and other potential values that are difficult to process and analyze in a reasonable time. In this respect, Big Data have been subject matter of theoretical studies, and practical applications in various business disciplines, from marketing, auditing and logistics to performance measurement, business planning, and budgeting.

For these reasons, firms must seek new tools and specialized methods to extract values from their processing. Accordingly, Big Data in these disciplines may be effectively used to improve

predictions of the trends in strategically relevant variables in a timely and more accurate manner through unstructured and tendentially “unconventional” information due to the concomitant use of different forecasting models (Hassani and Silva, 2015).

The scientific literature has shown that Big Data positively influence not only the depth and accuracy of predictions but also accounting practices. Big data’s interaction with accounting and provision of more accurate information (Liu, 2022) in a very short time have increased firm responsiveness in making strategic decisions that benefit competitiveness (Diaz and Bianchi, 2022). The interaction between Big Data and accounting, therefore, has essentially improved data collection and related analysis. In this field, however, scientific contributions and empirical evidence on how Big Data improve revenue estimation and cost allocation are still under investigated. The innovative augmented planning model has recently addressed the interplay between Big Data, accounting, and business planning (Moro Visconti et al., 2018). This model involves Big Data (mainly from e-commerce platforms and social networks) and accounting system to predict sales in real time through the Monte Carlo Method, a stochastic model with a multi-scenario approach. The authors chose the

Monte Carlo Method methodological approach because it is risk-oriented, which has become a critical issue in businesses after the financial crisis of 2008 and the 2020 Covid outbreak, and because it is an extremely versatile probabilistic simulation tool that can quickly regenerate forecasts based on the dynamic change of the forecast input database. Indeed, one of the most important aspects of the augmented planning model is precisely the dynamic nature of the overall extraction and processing system based on real-time updating of input data that allows for continuous regeneration of multi-scenario forecasts in a changing environment (Einav and Levin, 2014).

The aim of this research monograph is to explore the relationship between Big Data and accounting and the effects of this interactions on forecasting and business planning to demonstrate that data-driven approach reduces some limitations compared to traditional business planning.

Therefore, this study aims to reach the following objectives:

- providing further empirical evidence which confirms that the interaction between Big Data and accounting improves efficiency in attributing revenues and allocating operating costs.

- showing that this greater allocation efficiency has the effect of better accuracy and depth in measuring historical performance than accounting data and procedures.
- highlighting that greater accuracy and depth in the measurement of a firm's historical performance enables much more accurate forecasts, informed by stochastic model used by the augmented planning model, than those based on merely accounting data.

Albeit inspired by some aspects of the theoretical innovation proposed by the augmented planning model, the present study tries to make an extension of it in relation to two different features.

The first one concerns the interaction between Big Data and accounting. Unlike the augmented planning model, the interaction of Big Data and accounting envisaged in this study has a role in improving allocative cost efficiency rather than in “mark-to-market” forecasting of short-term sales. The second reason relates to the different parameters included within the multi-scenario forecasting and represented by the firm's earnings, as opposed to revenues predicted by the augmented planning model.

The analyzed company and operating setting, as empirical evidence, is about a small and medium-

sized firm *Alpha* (a fantasy name for privacy reason) operating in the industrial engineering (design of energy plants and energy transport networks) and construction sectors by acquiring contracts, predominantly through public tenders (Make to Order). The orders have a multi-year duration, and revenues are determined *ex-ante* by the tender contracts; in the short term, about 90 percent of the firm's revenues are certain. The firm is poorly digitized and, given the type of business, absent from both e-commerce platforms and social networks. Furthermore, its information system is characterized by poor interoperability among the firm's various data, isolating and not exploiting important strategic information for planning purposes. *Alpha's* planning system is mainly based on information from general accounting characterized by strong spatial and temporal aggregation. The firm's management would like to aspire to a more developed system of planning to allow, on the one hand, *ex-ante* control of disaggregated profitability and, on the other hand, the generation of more evolved short-term forecasts. To achieve the aim of this study, Alpha had to redesign its information system and acquire an automated system programmed for the extraction, normalization, reporting, allocation, and processing of general accounting information, job order cost

information from site accounting, GPS data related to firm vehicles and motor vehicles, and data from workers' badges.

In terms of scientific contribution this study falls between the literature on interaction between Big Data and accounting as well as on data-driven business planning.

In summary, the expected contribution is related to:

- the scarcity in the literature of similar studies carried out on data and information about a small and medium-sized company working on multi-year orders (Make to Order);
- the theoretical and practical implementation of a customized planning framework with a bottom-up data-driven approach;
- the practical implementation of a management information system for input data extraction, allocation, and forecast processing;
- the empirical evidence of the improvement in analytical and forecasting ability by adopting a data-driven planning compared with the top-down approach (“traditional planning”); at the same time, evidence of the increased information and strategic implication that a data-driven planning makes available to support management's strategic decisions.