



IDENTITÀ, INNOVAZIONE E IMPATTO DELL'AZIENDALISMO ITALIANO.

Dentro l'economia digitale

ATTI DEL XXXIX CONVEGNO NAZIONALE
ACCADEMIA ITALIANA DI ECONOMIA AZIENDALE - AIDEA

- Torino, 12 e 13 settembre 2019 -



A cura di:
Francesca Culasso
Michele Pizzo



UNIVERSITÀ DEGLI STUDI DI TORINO
DM DIPARTIMENTO
DI MANAGEMENT



**IDENTITÀ, INNOVAZIONE E
IMPATTO DELL'AZIENDALISMO ITALIANO.
Dentro l'economia digitale**

Collane@unito.it

Università di Torino

ISBN: 9788875901387



Quest'opera è distribuita con Licenza Creative Commons Attribuzione - Condividi allo stesso modo 4.0 Internazionale.

Disegno grafico: Davide Mezzino

Immagine di copertina: elaborazione grafica a cura di Davide Mezzino

PREFAZIONE

Da tempo e con continuità gli aziendalisti italiani hanno saputo interrogarsi sulla rispettiva identità e sul ruolo da ricoprire in un contesto generale, che per definizione è ritenuto dinamico e in continuo divenire. L'accelerazione intervenuta nel contesto tecnologico mondiale, che è evoluto nella direzione di una profonda rivoluzione digitale, sta innovando i modelli aziendalistici del passato e impone oggi nuove sfide e riflessioni alla nostra Accademia. Infatti, il processo in atto, innescato e alimentato principalmente da tre fattori interconnessi - la diffusione dei sistemi operativi e delle interfacce user-friendly, la rapida affermazione di Internet e del World-Wide Web e la convergenza di quattro settori di business precedentemente distinti (computer, software, comunicazione, media e intrattenimento) - oltre a introdurre nuovi modelli di business, modifica sempre più profondamente quelli tradizionali ed impone verifiche e cambiamenti negli schemi teorici di analisi dei fenomeni aziendali.

Intelligenza artificiale, Internet of Things, Internet of You, interfacce, social media, stampa 3D, cloud computing e dispositivi mobili in rete hanno contribuito alla diffusione di nuovi business model e alla generazione di ricchezza e valore economico. Inoltre, la digitalizzazione ha favorito l'introduzione di importanti modifiche nei processi produttivi tradizionali (come, dove, quando e con chi lavorare), accelerando la comparsa di nuove forme d'intelligenza organizzativa, attraverso la raccolta e l'analisi di big data. La velocità dei processi operativi, la flessibilità del processo decisionale, il modo di formulazione e implementazione delle strategie, le soluzioni con cui conseguire l'efficienza produttiva sono continuamente impattate da questi strumenti tecnologici, senza che nessuna dimensione delle moderne attività aziendali rimanga oggi immutata.

I Big Data e i flussi informativi oggi disponibili sono diventati sempre più rilevanti e fonte di *business intelligence* per le aziende. Le ricerche online e la raccolta di informazioni sul processo decisionale di acquisto permettono di tracciare i processi personali di scelta e valutazione. Questo bagaglio di dati - generalmente non economico-finanziari -, ove raccolto e analizzato, può supportare efficacemente le aziende nel definire gli approcci dei clienti e condizionare, di conseguenza, le scelte strategiche e le forme organizzative da adottare.

A questi cambiamenti tecnologici se ne sono aggiunti di ulteriori, legati all'ambiente economico, fisico, culturale e sociale, che hanno portato le aziende a prestare attenzione ai temi dello sviluppo sostenibile ed alle esigenze di accountability.

Innovazioni e cambiamenti nella gestione aziendale, cui si affiancano rinnovati aspetti di responsabilità sociale e necessari nuovi approcci orientati alla sostenibilità ambientale, in una radicale riconfigurazione dei processi di formulazione delle strategie aziendali, delle forme organizzative e delle modalità di comunicazione, rilanciano il ruolo degli aziendalisti e impongono una ridefinizione degli approcci concettuali tradizionali e l'individuazione di nuovi schemi interpretativi. Infatti, i nuovi modelli di business e le novità nei processi gestionali presuppongono "innovazioni" nel ruolo delle figure aziendali e nei processi strategici e operativi tesi alla creazione di valore, coinvolgendo tanto gli aspetti più tipicamente tecnico-industriali quanto quelli amministrativi, finanziari, d'informazione e controllo.

Alla luce di questa acquisita consapevolezza, l'Accademia Italiana di Economia Aziendale, con il convegno dal titolo "Identità, Innovazione e Impatto dell'Aziendalismo Italiano. Dentro l'Economia Digitale", che si è tenuto presso l'Università degli Studi di Torino il 12 e 13 settembre 2019, ha inteso invitare gli studiosi, italiani e stranieri, di discipline economico-aziendali a riflettere, forti della loro identità, sulla direzione che le scienze aziendalistiche devono intraprendere sin dal presente, specie alla luce delle profonde e dirompenti trasformazioni che stanno rapidamente modificando i contesti e i modelli competitivi. Questa pubblicazione contiene il frutto di tali riflessioni e offre un'opportunità per la generazione e diffusione di conoscenza su questi temi.

Francesca Culasso – Presidente del Comitato Scientifico del Convegno AIDEA 2019

Michele Pizzo – Delegato AIDEA e membro del Comitato Scientifico del Convegno AIDEA 2019

INDICE

Prefazione, di <i>Francesca Culasso e Michele Pizzo</i>	III
1. People analytics: ethical considerations for organizations, <i>Aizhan Tursunbayeva, Claudia Pagliari, Stefano Di Lauro, Gilda Antonelli.</i>	1
2. Do Consumers love the brand's Heritage? Il ruolo del Cultural Heritage nel Social Brand Engagement, <i>Luigi Grasso.</i>	6
3. Innovazione e tradizione: la tecnologia blockchain a tutela della tracciabilità nel mercato agri-food, <i>Alessandro Zardini, Cecilia Rossignoli, Ludovico Bullini Orlandi, Michele Meneghini.</i>	21
4. The leadership issue in co-design approaches to urban regeneration, <i>Alessandra Ricciardelli, Francesca Ricciardi, Elio Borgonovi.</i>	26
5. Sustainability, innovation, and transformation of the business model: the case of Eni spa, <i>Angelo Riva, Luciano Pilotti.</i>	29
6. Synchronistic events and management decisions. A conceptual framework toward an Affect-Cognitive Theory, <i>Matteo Cristofaro.</i>	45
7. La performance economico-finanziaria delle start-up innovative italiane: un'indagine empirica macroregionale sui bilanci con metodo Anova, <i>Guido Migliaccio, Pietro Pavone.</i>	54
8. La finanza inclusiva per la riqualificazione e valorizzazione di un bene culturale ad opera di una cooperativa sociale: un caso studio sul <i>social impact investing</i> , <i>Andrea Cuccia.</i>	72
9. The value relevance of information disclosed through the Integrated Report, <i>Stefania Veltri, Antonella Silvestri.</i>	84
10. Organizing the Enterprise 4.0. Multi-faced insights from a review of the Industry 4.0, <i>Lia Tirabeni, Paola De Bernardi.</i>	98
11. Strumenti di intelligenza artificiale per la progettazione di strategie collaborative interaziendali: una applicazione alle destinazioni turistiche, <i>Francesca d'Angella, Manuela De Carlo, Guido Ferilli.</i>	111
12. Automotive Aftermarket Business Model Evolution in the era of Digital Transformation, <i>Lucrezia Songini, Paolo Gaiardelli, Farnaz Jarrahi.</i>	124
13. Assessing the transparency of Sustainability Reporting of sustainability leader companies: Evidence from the fast fashion industry, <i>Imane Allam, Simone Scagnelli.</i>	134
14. Social media policy implementation model use for firm performance: policies and procedures, <i>Francesca Di Virgilio, Gilda Antonelli, Stefano Consiglio.</i>	141
15. La certificazione SA8000: standard emergente o fallito?, <i>Cecilia Chirieleison, Alessandro Montrone, Luca Scrucca, Teresa Turzo.</i>	151
16. Resistance to Growth in Italian family owned SMEs: Organising delegation processes, <i>Luigi Maria Sicca, Davide Bizjak, Luca Giustiniano.</i>	168
17. Venture capital, indicatori non convenzionali e fondamentali di performance: la start-up Mosaicoon, <i>Antonio Del Pozzo, Salvatore Loprevite, Domenico Nicolò.</i>	174

18.	Nuove piattaforme digitali per l'innovazione civica: il fenomeno del <i>civic hacking</i> , <i>Nathalie Colasanti, Chiara Fantauzzi, Rocco Frondizi.</i>	188
19.	Distance Learning and Continuing Education: an exploratory analysis of the Italian context, <i>Nathalie Colasanti, Chiara Fantauzzi, Rocco Frondizi, Marco Meneguzzo.</i>	198
20.	Un modello di business per gli acceleratori: una Structured Literature Review, <i>Maurizio Massaro, Carlo Bagnoli, Korinzia Toniolo, Daniel Ruzza.</i>	205
21.	Artificial Intelligence and Intellectual Capital: evidence from Fortune 500 companies, <i>Riccardo Macchioni, Giuseppe Sannino, Rosalinda Santonastaso, Giovanni Zampone.</i>	221
22.	Open innovation, strategic foresight and business models, <i>Diego Matricano, Elena Candelo.</i>	227
23.	The benefits of social responsibility: The phenomenon of B Corps in Italy, <i>Giovanna Afeltra, Patrizia Tettamanzi.</i>	234
24.	Valutazione di impatto sociale di una azienda non profit: il caso "AUSER Piemonte", <i>Davide Maggi, Paolo Rossi, Sara Marinello.</i>	249
25.	From Blockchain to Bitcoin and Beyond: A Social Learning Approach, <i>Christian Rainero, Giuseppe Modarelli.</i>	260
26.	Trust who? and trust what? Complementary and substitute forms of trust in the era of blockchain, <i>Maria Sciarra.</i>	274
27.	Comunicazione della responsabilità e sostenibilità d'impresa: bidirezionalità, dialogo, stakeholder engagement, <i>Damiano Cortese, Silvia Sinicropi, Elisa Giacosa, Massimo Pollifroni.</i>	286
28.	Il ruolo della blockchain per l'innovazione dei modelli di business, <i>Carlo Bagnoli, Maurizio Massaro, Daniel Ruzza, Korinzia Toniolo.</i>	290
29.	Reputazione aziendale, fiducia e sostenibilità delle imprese in fase di start-up, <i>Domenico Nicolò.</i>	305
30.	E-learning in universities: A literature review, <i>Teresa Anna Rita Gentile, Davide Bizjak, Ernesto De Nito, Rocco Reina.</i>	317
31.	Industry 4.0 e internazionalizzazione: un'analisi sistematica delle relazioni causali, <i>Giacomo Büchi, Monica Cugno, Rebecca Castagnoli.</i>	328
32.	Online quality dimension: cluster analysis in a shopping mall, <i>Cecilia Silvestri, Eleonora Rapiti, Michela Piccarozzi, Alessandro Ruggieri, Barbara Aquilani.</i>	341
33.	Planning a social media localization strategy in tourism. An empirical case, <i>Maria Garbelli, Manuel Gabriele.</i>	348
34.	Il ruolo delle APEA per lo sviluppo sostenibile delle aree industriali: analisi dello stato dell'arte e prospettive future in Italia, <i>Maria Rosaria Sessa, Ornella Malandrino, Daniela Sica.</i>	361
35.	Disclosure on judgements and estimation uncertainty under IFRS: a multidimensional framework, <i>Costanza Di Fabio, Alberto Quagli.</i>	375
36.	What is behind the choice of the quality of Legality rating by Italian private firms?, <i>Fabio La Rosa, Sergio Paternostro, Francesca Bernini.</i>	389
37.	I sistemi di monitoraggio e valutazione della didattica, della ricerca e della terza missione delle università attraverso la lente delle logiche istituzionali, <i>Valter Cantino, Francesca Culasso, Paola De Bernardi, Elisa Giacosa, Francesca Ricciardi, Enrico Sorano.</i>	401

38.	Il ruolo della PA italiana nella promozione dell'efficienza energetica e nella realizzazione di percorsi urbani sostenibili, <i>Daniela Sica, Ornella Malandrino, Stefania Supino, Maria Rosaria Sessa.</i>	418
39.	A Critical Discourse Analysis of the Volkswagen Letter to Shareholders after the Diesel Scandal, <i>Alice Francesca Sproviero, Cristina Florio.</i>	429
40.	Fra potenzialità e ostacoli: i social media interni nelle aziende italiane, <i>Alessandra Mazzei, Silvia Ravazzani, Alfonsa Butera, Luca Quaratino, Chiara Fisichella.</i>	438
41.	Accounting e accountability per le smart city: misurare e orientare il loro contributo ai Sustainable Development Goals, <i>Clara Benevolo, Renata Paola Dameri, Roberto Garelli.</i>	446
42.	What do 1,300 accounting history papers talk about? Evidence from a semi-automated content analysis, <i>Paolo Ferri, Maria Lusiani, Luca Pareschi.</i>	464
43.	Accountability in social services provision. Three cases from the sixteenth century Republic of Venice, <i>Maria Lusiani, Chiara Pancot, Marco Vedovato.</i>	478
44.	How the quality of Corporate Governance structure impact on CSR disclosure. Some insights into Italian Listed Companies, <i>Katia Furlotti, Pier Luigi Marchini, Alice Mediolì, Veronica Tibiletti.</i>	489
45.	Implementation of segment reporting in healthcare public sector: profiles of innovation and accountability needs, <i>Monica Giancotti, Marianna Mauro.</i>	503
46.	Open Government Data and Service Quality: an empirical analysis within the public sector, <i>Aurelio Tommasetti, Orlando Troisi, Gennaro Maione, Carlo Torre.</i>	515
47.	Il modello di business "Freemium" nel settore musicale ed i fattori incentivanti del passaggio da utente free a premium: Evidenze empiriche dal caso Spotify, <i>Monica Faraoni, Claudio Becagli, Lamberto Zollo.</i>	526
48.	La creazione di valore sostenibile: un nuovo modello per le aziende, <i>Ivo Hristov, Antonio Chirico.</i>	540
49.	Do Companies walk the talk? Impression Management and Signalling Practices in Integrated Reporting context, <i>Pigatto Giacomo, Cinquini Lino, Tenucci Andrea.</i>	550
50.	Risk Appetite in Banks' Reports, <i>Chiara Mio, Marisa Agostini, Silvia Panfilò.</i>	564
51.	Cultura nazionale e livello di digitalizzazione delle imprese europee: evidenze empiriche, <i>Michele Rubino, Filippo Vitolla, Nicola Raimo, Antonello Garzoni.</i>	581
52.	Gli Spin-off di ricerca come spinta allo sviluppo di un'economia circolare, <i>Stefano Poponi, Enrico Maria Mosconi, Gabriella Arcese, Olimpia Martucci, Simona Fortunati.</i>	594
53.	Contrasting Digital Fake News in Health: an Interdisciplinary Approach, <i>Luca Marinelli, Rossana Berardi, Federica Pascucci, Gian Luca Gregori.</i>	610
54.	Le donne nei CdA delle imprese di capitale in Italia: quali implicazioni per la struttura finanziaria?, <i>Mariasole Bannò, Graziano Collier, Giorgia Maria D'Allura.</i>	618
55.	Does artificial intelligence perform managerial control practices in complex settings?, <i>Filippo Zanin, Eugenio Comuzzi, Giulio Corazza.</i>	627
56.	La "social communication" nel settore vinicolo: vini pugliesi vs vini globali, <i>Federica Cavallo, Monica Fait, Paola Scorrano, Amedeo Maizza, Lea Iaia.</i>	638
57.	Blockchain technology applications in the hospitality and tourism industry: insights from the LockTrip project, <i>Fabiana Roberto, Roberto Maglio, Andrea Rey.</i>	645

58.	L'applicazione in Italia della normativa relativa alla rendicontazione sulle informazioni non contabili (non finanziarie): alla ricerca della confrontabilità, <i>Claudio Sottoriva, Andrea Cerri.</i>	660
59.	Related Party Transactions Disclosure Determinants: Empirical Evidence from Italy, <i>Giovanni Ossola, Guido Giovando, Stefano Venturini.</i>	665
60.	La Telemedicina tra innovazione e sostenibilità: modello operativo generale e tassonomia delle risorse coinvolte, <i>Francesco Ranalli, Gabriele Palozzi.</i>	674
61.	Strategies of smart service in the public administration, <i>Angelo Riva.</i>	684
62.	Fundraising on social media: A review of strategies and benefits, <i>Stefano Di Lauro, Aizhan Tursunbayeva, Gilda Antonelli.</i>	695
63.	An exploratory study about fake news and Gen Z, <i>Fabrizio Mosca, Cecilia Casalegno, Valentina Chiaudano.</i>	703
64.	Le reti di imprese: un'opportunità per lo sviluppo dell'innovazione nelle PMI. Il ruolo del manager di rete, <i>Patrizia Pastore, Antonio Ricciardi, Silvia Tommaso.</i>	710
65.	Evaluation, performance and strategy improvement in the digital age, <i>Angelo Riva.</i>	724
66.	Social media in the digital era: the case of Ducati Motor, <i>Angelo Riva.</i>	735
67.	L'impiego della tecnologia blockchain nella filiera agroalimentare: opportunità e sfide, <i>Cinzia De Angelis, Grazia Chiara Elmo, Rosario Fondacaro, Mario Riso.</i>	749
68.	La <i>disclosure</i> della tecnologia nei bilanci. Informazione finanziaria o non finanziaria?, <i>Maura Campra, Sabrina Pucci, Marco Venuti, Valerio Brescia, Umberto Lupatelli.</i>	758
69.	Le condizioni abilitanti della Cartella Clinica Elettronica (C.C.E.): il caso della ASP di Cosenza, <i>Concetta Lucia Cristofaro, Marzia Ventura, Walter Vesperi, Anna Maria Melina, Rocco Reina.</i>	768
70.	L'impatto della sostenibilità sui nuovi modelli di business e sulla misurazione dei risultati. La stima del valore economico-sociale generato dall'albergo diffuso, <i>Antonietta Cosentino, Barbara Iannone.</i>	779
71.	Paure e insicurezza lavorativa nelle organizzazioni: fattori che condizionano la crescita aziendale e il benessere dei lavoratori. Una ricerca esplorativa, <i>Diego Bellini, Serena Cubico, Giuseppe Favretto, Piermatteo Ardolino, Marino Bonaiuto, Barbara Barbieri.</i>	793
72.	Smart label/packaging in the food industry: a preliminary literature review, <i>Erica Varese, Anna Claudia Pellicelli.</i>	806
73.	Change, vagueness and complexity: Integrated Reporting in the public sector, <i>Silvia Iacuzzi, Andrea Garlatti, Paolo Fedele, Alessandro Lombrano.</i>	818
74.	L'utilizzo dei <i>Big Data Analytics</i> nella Gestione del Rischio: Analisi di un Caso Studio nel Settore Bancario, <i>Grazia Dicuonzo, Erika Zappimbulso, Graziana Galeone, Vittorio Dell'Atti.</i>	829
75.	Has the disclosure of alternative indicators by "digital" companies changed in recent years?, <i>Rosa Vinciguerra, Francesca Cappellieri, Anna Gravante.</i>	839
76.	Verso una mobilità sostenibile? Il bike sharing in Italia, <i>Maria Francesca Renzi, Maria Giovina Pasca, Roberta Guglielmotti Mugion, Martina Toni, Laura Di Pietro.</i>	849
77.	Key drivers of entrepreneurial ecosystems enabling family business to address sustainable business model innovation, <i>Fahimeh Khatami, Umberto Bocchino, Valter Gamba.</i>	862
78.	I Green Bonds nel settore agricolo per contrastare i cambiamenti climatici, <i>Federica De Leo, Stefania Massari, Benedetta Coluccia, Valeria Stefanelli.</i>	873

79. Is there a theory of the firm for non-financial reporting? The case of Integrated Reporting, *Laura Girella, Giuseppe Marzo, Mario Abela.* 884
80. Un modello di ROI per la valutazione e la gestione della creazione di valore in Industry 4.0, *Riccardo Giannetti, Lino Cinquini, Mario Rapaccini.* 899
81. La natura “familiare” dell’impresa e l’influenza sulla qualità dell’informativa non finanziaria, *Valter Gamba, Enrico Maria Bocchino.* 914
82. Sostenibilità e Innovazione: quale prospettiva per le PMI?, *Franco Ernesto Rubino, Elena Cristiano, Francesca Aura, Olga Ferraro, Tonia Tassone.* 928
83. Work-family interference, integration and job-family satisfactions, *Muhammad Ghayyur.* 943
84. Corporate social responsibility: good practices and implementation of the added value process towards the circular economy, *Simona Fortunati.* 960

55. Does artificial intelligence perform managerial control practices in complex settings?

Filippo Zanin, Università degli Studi di Udine, filippo.zanin@uniud.it.

Eugenio Comuzzi, Università degli Studi di Udine, eugenio.comuzzi@uniud.it.

Giulio Corazza, Università degli Studi di Udine, corazza.giulio@spes.uniud.it.

Abstract

Information Technology (IT) has displayed and continues to display an important role in performing management control practices. The amount of data and information required has steadily grown over time forcing firms to adopt continuously innovative tools and computer techniques. Recent technological advancement has shifted further the attention to an advanced form of Business Analytics, the Artificial Intelligence (AI). This term is referred to the computer simulation processes of human thinking (Li, Zheng, 2018). Computers can learn and perform tasks which were previously considered to require human intelligence. The emphasis on AID translation as a relational and situated accomplishment sheds light on our understanding of the interconnections between accounting technology innovations and the transformation of existing accounting apparatus. How exactly, for example, are managers to make the AI the socio-technical device to change and adapt control practices in-use, facilitate interaction and sense-making among different organizational levels, and support the exploration of radically new accounting and control practices? How do accounting visuals enable certain way of acting for the transformation of the calculative space and legitimate the frame of a radically new space? The paper is structured in two main sections. The first presents a literature review about the evolution of AI solutions in managerial control field by integrating theory and practice perspectives. The second tries to fill the AI literature gap through the analysis of a case study of AI implementation in a large manufacturing Italian company. We draw on a specific managerial control practice, the evaluation of ongoing multi-years contracts, in order to bring out the performative effects of AI on managerial control actions and decisions. Drawing on discussions with managers and software developers, and direct observations drawn from across the functional hierarchy within the organizational unit devoted to perform the evaluation task, we elaborate the ways in which consultants and managers achieve a specific subsets of operational objectives, such as the simplification of control procedures, the interaction among people and the constitution of more specialized cognitive and decision-making processes.

Keywords: Artificial Intelligence, Calculative Apparatus, AID Translation, Translative Calculative Space, Performative Effects.

1. Introduction

This paper examines the performative effects on calculative practices deriving from the introduction of an Artificial Intelligence Device (AID) that promise to increase the computational capability for the valuation of ongoing multi-year contracts of a multinational corporation. AID is a computer simulation process of human thinking (Li, Zheng, 2018) whose use in accounting and management control activities (budgeting, planning and reporting) is said to reduce processing times and ensuring greater reliability on accounting data. In particular, the focus of this study is on the social, material and semiotic processes that perform the translation of the AID into the calculative apparatus in use and on the generative effects on its transformation. A calculative apparatus is defined as the situated assemblage of devices, actors and rules that interactively perform a calculative practice. This assemblage is both a process and a provisional outcome that shifts and change organically and in an emergent manner assuming a new stabilized form (Martinez, Cooper, 2019).

The application of AID is a practical challenge for consultants and managers to transform a consolidated accounting apparatus with elements relevant and specific to a local situation. These elements are new forms of knowledge that arise in an unexpected way while the translation process is acting due to the potential that AID possess to engage a specific accounting apparatus (and the interconnected apparatuses) and mobilize actions (Quattrone, 2009). The emphasis on AID translation as a relational and situated accomplishment sheds light on our understanding of the interconnections between accounting technology innovations and the transformation of existing accounting apparatus. How exactly, for example, are managers to make the AI the socio-technical device to change and adapt control practices in-use, facilitate interaction and sense-making among different organizational levels, and support the exploration of radically new accounting and control practices? How do accounting visuals enable certain way of acting for the transformation of the calculative space and legitimate the frame of a radically new space?

In doing so, our analysis makes three contributions to the literature that examines the role of accounting inscriptions in the implementation and diffusion of an accounting innovative technology. First, it makes new

methodological insights on the study of the translation of a new accounting technology by stressing the importance to adopt a processual approach. This approach leads the researcher to pay close attention to the interactive and interconnected sequence of macro and micro actions that frame and reframe the translation process. Taking seriously in consideration the unfolding of the translation process allows to provide new explanations, not be drive by rationalism and regularity. Second, this study sheds light on the uncertain and provisional outcomes of the transformation of existing calculative practices during the translation of AID; although the potential of accounting inscriptions to engage users in practice because of the constantly changing rationales for its use has been largely recognized in accounting literature (Busco, Quattrone, 2015), their effects on actions still remain partial because attention is paid only on one performative effect. In examining the continuously changing nature of the accounting practice and the provisional reconfiguration of the calculative space, we find that accounting inscriptions are themselves a process that change because of the multiple and intertwined roles they play. While they frame new rationales, mediate and connect different actors and generate knowledge that is instilled in the transformation process, they also change and old inscriptions are replaced by newer but nevertheless still provisional forms. Third, this study emphasizes the importance to take a close look at the interaction between sensemaking and materiality in the accounting change project. Sensemaking is a cognitive ability that which explains the change by referring to the ability to reasoning, reflections and sharing of meanings among different human agents that are involved in the process. Materiality refers to the performativity of the objects, like accounting inscriptions, and the affordances they permit in the framing of collective thinking and the enabling of change in the accounting practices.

The paper is structured in two main sections. The first presents a literature review about the evolution of Information and Communication Technologies in managerial control field by integrating theory and practice perspectives. Practice perspective provides a short description of the operating solutions that leading software developers, such as Google, IBM, Microsoft, Oracle and Sap, currently offer to the market.

The second tries to fill the AI literature gap through the analysis of a longitudinal field study of AI design and implementation in a large manufacturing Italian company. We draw on specific managerial control activities in order to bring out the performative effects of AI on managerial control actions and decisions. Drawing on discussions with managers and software developers, and direct observations drawn from across the functional hierarchy within the organizational unit devoted to perform accounting and management control activities, we elaborate the ways in which the middle managers of a business product line sought to use AI to achieve, if not grand strategic missions, at least specific subsets of operational objectives, such as the simplification of control procedures, the interaction among people and the constitution of more specialized cognitive and decision-making processes.

2. Literature Review

2.1 The advancement of IT in accounting and management control

The advancement of Information and Communication technologies have not changed only people's lives, but also the way businesses operate (Suhaimi, et al., 2016). Since the introduction of Enterprise Resource Planning (ERP) systems in the 1990s, many organizations across various industries have started utilizing IT solutions to improve competitiveness, organizational efficiency and, ultimately, performance (Arnold, 2006). The contribution to the performance is achieved through the integration of these computer-technologies innovations with MCS, including specialized BI&A (Business Intelligence and Analytics) modules. Another revolution in BI&A and its application on the managerial accounting concerns the Artificial Intelligence (AI), that is usually considered a sub-field of BI&A within computer science and it is concerned with intelligent behavior by computers. The concept of AI was brought-up for the first time in 1956 by John McCarthy at the University of Dartmouth in the United States (Luo, et al., 2018) and it refers to the computer simulation processes of thinking (Li, Zheng, 2018). The underlying assumption of AI is that computers can learn and subsequently perform tasks which were previously considered to require human intelligence. Recent advancements in AI, especially machine learning, have opened up new vistas for the managerial accounting and control. For example, the application of machine learning to develop models for forecasting by combining qualitative and quantitative analysis technique, in order to obtain better predictable and reliable future. The machine learns the method to revise the forecasts based on a variety of past experiences and real time relevant events, simulating inductive and deductive reasoning. In general terms, AI should replace every step of production of data accounting and increase the reliability of the forecasts by supplying timely and reliable data. Some examples of AI applications for planning and forecasting provided by the leading software developers are reported in the table below.

Table 1. Artificial Intelligence tools for management control practices.

Software developer	AI solution	Features	Implications on managerial accounting
Oracle	AI integrative solution	Predictive Analytics	Planning and Forecasting Increase in quality of scenario prediction. Machine learning allow to elaborate much more data from many sources. The base of the prediction changes from the past information to the present information Improve control of process. Reducing in time of process planning. Continuous control of the process, automatic modification of the goal
IBM	Watson	Full cycle of AI management Machine learning Data preparation processes Data exploration processes Model development and evaluation Model deployment and management Watson integration with the most common information systems Continuously development of the platform Assistance on application, software and hardware solution	Planning and Forecasting Increase the amount of data analyzed Explain the course of action chosen in the moment in which action is taken Augment the number of the variable that take part in the process of planning Build many different sub-scenarios in the same time, that are the specification of the main scenario with the purpose to give consistence in the process of strategic definition Accelerate the process of strategy re-definition
SAP	Leonardo	Machine Learning solution Accounting Blockchain Application of Internet of Things Data Intelligence Visualization of data Big-data management ...	Planning and Forecasting Simulation across multiple dimensions Increase in goal transparency and reliability Work on real-time prediction Save in time of planning and forecasting and reducing the human errors of prediction Harmonize the process and data. The use of common process in all level of organization increase the level of data understanding
Microsoft	Azure AI	Knowledge mining Machine learning Data bricks Integration with all software solutions	Planning and Forecasting Analysis of the consumer behavior and sentiment Enhance the prediction of the market characteristics Improve the validity of the data visualizations Process of strategy reshaping integrated with the environmental factors
Google	Google Cloud Platform AI	Computing and Machine Learning Reporting and data analysis Data Security	Planning and Forecasting Possibility to do simultaneously multi-level and multi-perspective scenarios Increase the reliability of the data Improve in the accuracy of the prediction Autonomous redefinition of the key variables

Source: personal elaboration of public data.

The moving from technology research to business management is becoming a new research field. However, management and accounting control literature highlights an important gap that concerns the theoretical and empirical underpinnings of the implementation and use of AI solutions. As stated by Quattrone (2016), the digital revolution poses to management accounting and control a paradox. On the one hand, the implication of innovative tools and computer techniques is extending the field of the measurable. Finance and accounting data are increasingly considered as inputs with doubtful but unquestioned qualities, ready to be applied to strategic and operative decision-making. On the other hand, the amount of data, uncertainty and ambiguity will tend to increase because it is assumed that innovative tools and computer techniques can automate complex calculative processes replacing human works. Digitalization is said to altering decision-making processes by

changing the relationship between knowledge and action, with the exercising of judgment that begins when data have already been build, recorded and packaged into standardized management reports (Quattrone, 2016). This innovative mode of producing accounting numbers is part of a collective stream of research whose aim is to achieve a perfect and complete system of representation. Studies of the application of AID in auditing (Baldwin et al., 2006; Omoteso, 2012; Sutton et al., 2016), information systems of management accounting (Mirzaei et al., 2017) and business intelligence (Rikhardsson, Yigitbasioglu, 2018) aspire to the achievement of a perfect and complete system of representation by fulfilling the incompleteness, opacity and fragility of accounting data. AID is assumed to make this ambition possible due to its intrinsic qualities. It is a rationalist approach that stresses a self-evident linkage between AID and its promised effects on the production of accounting data. However, this functionalist approach has leveled criticisms at understanding the generative processes that arise when performing management control practices while AID is adopted. In line with the studies of accounting in practice (Chua, Mahama, 2007), an alternative approach focuses on the performative effects that the interaction between human and nonhuman actors generate on accounting and managerial control practices in use. This study builds on this shift in attention focusing on how the translation of an AID into the calculative apparatus of a pilot project designed to automate the valuation of ongoing multi-year contracts is generative and enables unexpected changes in the calculative practice. Some previous studies of implementation have examined how a new technology is applied and diffuse into the accounting and managerial control practices of an organizations by adopting a practice-based view. They have emphasized the roles of boundary objects (Briers, Chua, 2001) and accounting inscriptions (Qu, Cooper, 2001; Busco, Quattrone, 2015) for the engagement of a group of human actors coming from different backgrounds into the translation and customization process. This paper concurs that change is an unfolding socio-material accomplishment where agency is the complex outcome of an intricacies of relational and situated practices. It complements but also differs from previous studies. We don't examine solely the mediating effect performed by objects (e.g. data repositories) or accounting inscriptions (e.g. accounting visuals) through which heterogeneous human actors, both inside and outside organization, interact for developing understandings, sharing meanings, making legitimacy and stabilizing among different interests (Briers, Chua, 2001; Cooper, Ezzamel, 2013; Quattrone, Hopper, 2005; Cooper et al., 2019). Neither do we refer to the incompleteness of accounting representations with the aim to highlight the epistemic power of accounting inscriptions in creating generative tensions that allow a process of questioning and search (Busco, Quattrone, 2018). We also don't emphasize the circumstances and contingencies that move change (Bhimani, 1993). Instead we use Actor Network Theory (ANT) by framing on the actions of humans and objects that are tied together in the experimental implementation of an accounting technology, namely an AID for the evaluation of ongoing multi-year contracts. We analyse the multiple, interconnected and mutually constitutive socio-material and discursive engagements that perform the provisional outcomes of the existing calculative apparatus while translation occurs.

2.2 Engaging and performing a calculative apparatus

The adoption of ANT allows to focus on the social, material and semiotic processes by which AID is translated into accounting and control practices and on the unexpected performative effects that generate changes on the existing accounting apparatus. The latter is defined here as the assemblage of human actors, objects and texts that interactively engage each other while mobilize action. The concept of assemblage is not new in accounting research (Deleuze, Guattari, 1987; Martinez, Cooper, 2017; Miller, Power, 2013). It is a way for drawing attention to the abstract and material space made up of the accounting inscriptions and specific calculation that enable actions in this space (Rose, 1999). What it is important to highlight is that a calculative space is not about the technical devices adding a calculation or an order, neither on the integration between different devices. It is a matter of interaction and unexpected transformation. The arrangement of the elements of a calculative space concerns the mutual engagement of one element another. An element allows performing the action of another or the assembled whole because «contains the terms and materials to engage with the totality of devices that compose the workspace that they are a part of» (Martinez, Cooper, 2019, p.3). This arrangement where action is performed as a relational accomplishment through the interaction between cognition, materiality and culture is both a process and an outcome because the transformation emerge as a provisional result of engagement and action. Each element is open to change for receiving the performative effects of other and release its potential for action. When the elements shift and change organically, also the whole change often in an unexpected way.

Studies that adopt a practice perspective on the implementation and diffusion of an accounting technology stressed the idea of a calculative space, where the engagement with the technological device or expert systems (for example, BSC) is related to building a stabilized and mediated network of users and disseminating success stories (Cooper et al., 2017). Quattrone's (2009) research on the visual power of accounting treatises highlighted the persuasive and generative effects of the accounting inscriptions. Rhetorical devices are classificatory and ordering tools that organize a visual space where accounting practice is performed. Moreover, these inscriptions are viewed «as forces, as acts and effects of engagement (Fabbri, 1998), which

ignite the process of knowledge fabrication» (Quattrone, 2009, p. 89). Busco and Quattrone's (2015) empirical research on the enabling effects of the accounting visuals in a large oil and gas corporation involved in the implementation of a BSC suggested that the continuously changing rationales of the use of BSC and the emergence of functions that reach beyond those that it is said to have are activated by the incompleteness of the practices of representation and measurement. This "absence" makes the engagement of the users possible and stimulates sensemaking processes that undergo a series of transformations of the rationales and uses of accounting technology. Similarly, Qu and Cooper's research (2011) examined how the population of BSC scorecards by users was stimulated by the accounting space where meanings are negotiated and constructed through the use of local knowledge. A closer attention to the unfolding and transformative nature of the workspace is provided by the Martinez and Cooper 's research (2019) on how a loose network of funding agencies and nongovernmental organizations (NGOs) assemble a performance and management system. The focus is on the active role that visual patches play for the engagement of users and on how these patches accumulate their calculative functionalities making the engagements always open to transformation. The emphasis on the dynamics of engagement and performativity emerges also in the Busco and Quattrone's (2018) work on the generative effects of visual accounting inscriptions. By providing with empirical data from a longitudinal case studies of a mid-size Italian fashion firm, they found that the use of accounting visuals (accounting data and representations, performance measures, reports) sustain the creation of a visual space where generative tensions are enabled. These tensions stimulate innovation and emerge when accounting inscriptions act as epistemic objects while users perform a calculative practice (the budgeting process). These prior studies pose some limitations. First, excepting for the Martinez and Cooper's work (2019), they analyse the construction, stabilization and mobilization of the calculative space that emerge from the enabling power of one accounting technology. Second, they do not deal with the theme of agency in performing accounting practices in a balanced way because they emphasize the cognitive dimension or, alternatively, the role of materiality. Therefore, a post-modern vision of agency that explicitly takes into account both the socio-cognitive interaction among users and the materiality of accounting inscriptions is still not every evident. Third, the enabling functions of materiality are referred only to one specific set of performativity: reasoning (ordering and organizing), mediating meaning, generating knowledge. This single view on performativity leaves in the darkness the chains of mobilization of the action from reasoning to generating performative effects and vice versa, with meanings that are mediated by connecting boundaries.

Table 2. Performative effects and the impacts on action.

Performative effects	Processes	Impacts on action
Reflective	Sensemaking	Abstraction
Mediation	Networking	Collectivization
Epistemic	Generating	Innovation

Source: personal elaboration.

3. Framework and methodology

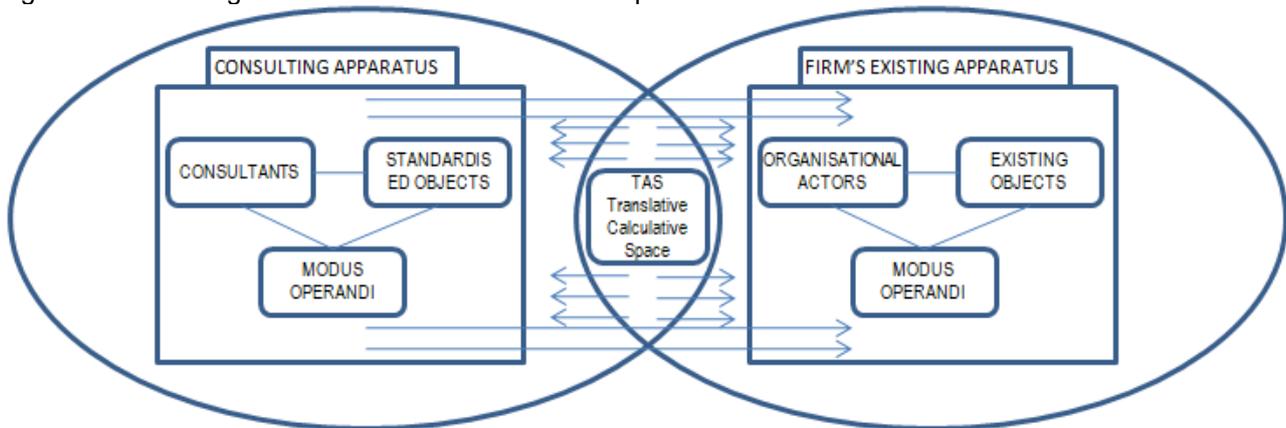
Our study adopts a processual view of the social, material and semiotic aspects of the multiple and recursive engagements that emerge while an experimental project of AID implementation for the valuation of ongoing multi-year contracts is acted. Specifically, we explore what happens when an AID is introduced in the existing accounting apparatus of a multinational Italian company that operate in the steel industry. We reconstruct the process from actions, experiences and narratives of the internal and external agents (organisational members and external software developers), emphasizing both the cognitive and the materially mediated engagements among two different accounting apparatuses: the consulting apparatus and the firm's existing apparatus. We find that the translation of the consulting apparatus into the existing practices substantiates a calculative space, that we call Translative Calculative Space (TCS), where different types of engagement are enabled for the transformation of apparatuses (fig. 1).

These socio-material engagements are conceived as the processes through which reasoning is stabilized and organized, meanings are mediated and new forms of knowledge are fabricated. They are analysed along with the development phases of the AID translation (table 2). This peculiar angle provides in-depth insights on the performative effects of AI implementation in the creation of a TAS, when diverse calculative apparatuses interact and engage each other by alternating stability (the provisional outcome) and change (the process).

In accordance with this explorative nature, the study follows a qualitative inductive research design, based on a single case, i.e. the most useful design when in need to develop a rich understanding of specific phenomena (Langley, 1999). Starting from the assumption that AI is not just a technology to be used in accounting practices but a socio-technical device able to diffuse multiple performative effects, the context and social action become themselves object of analysis and potential explanatory factors of the phenomena under study. The theorizing process emerged gradually and systematically from the observation of facts and interpretations (Glaser and Strauss, 1967; Charmaz, 2006), and within a continuous sense-making process through activities of analysis,

coding and interpretation of the data as they were collected, and of visualization of provisional topics (Czarniawska, 2014; Comi et al, 2014).

Figure 1. The emergence of a translative calculative space.



Source: personal elaboration.

The setting is the Management Control Office of the headquarter of a large Italian company (D&C, hereinafter) and the three main accounting processes: data uploading, data analysis and data reporting. We chose this setting for two main reasons. The first is a pragmatic reason, in that one of the authors followed the whole process as one of the members involved in the design and implementation team, which gave us an exceptional access to data. The second reason is a theoretical one: the AI design and implementation project was intentionally promoted by the Chief of the Management Control Office, aiming to be participative and inclusive of a wide array of views from a selected group of the members of the Office, and the software developers. We relied on four sources of data: Interviews with managers and consultants, field notes from internal meetings, artefacts (process maps, subsequent revisions, tables with figures, other visuals) and other internal documents including preliminary reports, off-line data warehouse and spreadsheets. Most data were collected in real time. Direct access to mostly real-time data enhances the validity of our analysis, limiting subjective retrospective bias of informants. The analysis of fieldwork material was an ongoing process, allowing us to elaborate various explanations of what was occurring. Research notes were made during headquarter visits, internal meeting, meeting with managers and consultants, field observation and analysed immediately after these events, to preserve the details as much as possible. The analysis was conducted collectively in order to stimulate a rigorous comprehension of the recorded events and a precise recognition of emerging meanings. Interview transcripts and field notes were codified and organized chronologically. Common issues in the accounts were analyzed to capture key themes. An iterative approach was used to circle back and forth between key themes and theoretical insights.

3.1 The project

The choice to analyse the pilot project of the implementation of an AID for the evaluation of the ongoing multi-year contracts is threefold. First, the experimental nature of the implementation allows to refer to the translation process that it is «crucial in converting an abstract idea in what is seen as a practical technology» (Cooper et al., 2017, p.995). The implementation of a new accounting technology raises questions of customization and contextualization to local circumstances because technologies are often modeled in a standardized form to appeal to a broad audience (Armstrong, 2002). The need to adhere to the local circumstances enable the creation of a translative space where enabling processes of reconstruction and variation of the involved apparatuses take form (Qu, Cooper, 2011). The transformation is a knowledge-generative process that emerge from the cognitive, material and symbolic engagements acting on the TCS.

Second, the experimental nature of the project suggested the creation of a dedicated working team. The team consists of 3 organizational members (the chief of the management control office, the chief of the business controllers and the manager that is the owner of the evaluation process of the ongoing multi-year contracts) and 2 consultants (manager and technician of the software provider). To these were added 2 researchers, who were involved in all phases of the translation processes. The creation of a teamwork, where tasks were defined and assigned to each participant before to start the translation processes, facilitated the construction of the perimeter of action and a clear recognition of the single actors-object-modus operandi relationships. Third, since the project was announced as experimental by the Chief of the Management Control Office, the barriers to sharing ideas, knowledge and experiences were easily overcome by each person involved. This has allowed to generate a spontaneous interaction between organisational members, consultants and researchers that has made the emergence of different forms of engagements ever more evident.

Since the project involved multiple people (organisational managers, consultants and researchers) it is important to explain who they were, their background and roles in the development of the project, in order to understand the multiplicity of human actors and their impact on actions. The AID project was officially disclosed in March 2018 and first activities on the project were delivered starting from April 2018. The locus of the AID implementation is the headquarter of a multinational that operate in the steel industry. The headquarter is located in the North-East of Italy and the accounting and management control practices that are performed by the staff of the Management and Control Office regard the parent company (D&C). The consulting company comes from a selection process. After analyzing the proposals from the four big IT consulting firm that are leading the unexplored field of the AI applications for business purposes (Oracle, Accenture, Sap, Microsoft), the choice fell on a small, local and highly-specialized IT consulting company, which already knew data infrastructure and calculative devices in use. Matteo, the chief of the staff of D&C Business Controllers, was designed to lead the AID project because of the consistency of his background (he recently got a Master Degree in IT solutions for business). Elena is the owner of the process of ongoing multi-year contracts evaluation for D&C. She has a large experience in the field and knows very well the articulated flow of activity along which a multi-year work order develops. He is also a very skilled in making collaborative relations with projects managers for making information exchange timely and flexible. Marco was the lead IT consultant with more than 20 years of consulting experience. He had taught executive education on the topic of performance measurement and analysis and recently he had worked extensively with AID. Finally, Giovanni was the expert of software developing that assisted Marco during the phases of project design and implementation. The project started with a broad aim to «make the evaluation process more fast and able to become a knowledge-generative process» [extract from the interview of the Chief of the Management Control Office]. The intent was twofold. First, the implementation of AID is expected to improve the technical aspects of the evaluation process, like data integration and reliability. Second, in line with a strategic view of the process, the improvement of the value added by the process itself to the decision-making. The evaluation of ongoing multi-year contract is a calculative practice that performs for a wide array of uses and users, for example the measurement of inventories for fiscal ends, the budgetary control, the analysis of the performance of a line of contracts. The strategic value of the evaluation processes refers to the outcomes that support a decision-making process. The implementation of an AID is viewed as a possibility to improve the impact of the strategic value of the evaluation process by offering a larger amount of finalized data. The latter are data suitable for mobilizing knowledge collectively and, thus, for improving the quality of the decision-making where consensus on objectives and the way to reach them is necessary. According to Matteo, «accounting numbers that comes from a systematic performance measurement process are not intrinsically useful. They are one of the elements that business controller, project manager and the CEOs use for articulating a complex decision-making [...] if you think that the steel industry is said to be in a steady state where imagining the future is more and more a creative and judgmental activity, making sound forecasts about the ending of a multi-year contracts is a dream. Accounting data are weak information that user applies to decision together with other elements in order to create a rich context for decision...to get a large amount of data increases complexity but can improve the quality of the decision-making» [extract from the interview of the Chief of Business Controllers]. To focalize the multiple engagements and their performative effects, our analysis concerns the implementation of AID into the sample multi-year contract DC001. This contract is referred to the construction and selling of a rolling mill.

Table 3. The phases of the AID translation.

Phases	Processes	Objects	Outcomes
Mapping the existing process [Researchers were asked to deliver the flow of activities: data input, data processing, data output, timing and data receiver]	(a) Interview with Elena (b) First release of the structuration of contents (c) Feedback session, meeting with Matteo, Elena and other manager of the Office, partially involved in the evaluation (d) Final release of map	Visualization of the macro-process by printing the single micro-process flow of activities and posting on the wall of the meeting room	Full awareness of the process Changes to be done for quality and efficiency improvement Identification of the perimeter of AID application and selection of the DC001 sample contract
Problematisation by focusing attention to the sample contract named DC001	(a) Extrapolation of the flow of activities of the DC001 contract from the whole process map (b) Clear identification of the sources of data and their features (reliability, formalization,	Map of the flow of activities and distinction between human-centered activity and machine-centered activity Map of the data warehouse	Identification of the redundancies, contradiction and ambiguity of calculative practice Identification of the supporting activities and their absorption of time

	availability, means of acquisition...) (c) Design of the connection between the different sources of data (d) Reconstruction of the calculative processes and its iterative nature (e) Data reliability testing	Internal document that Elena use for practicing offline calculation Internal document that Elena use for checking the reliability of preliminary data Email exchanges with the project manager and finance office	Analysis of the compatibility of different data warehouse
Design of the AID for the evaluation of a sample working contract, named DC001	(a) Presentation and description of the DC001 flow of activities to consultants (b) Presentation and description of the AID that IT consultants suggest to implement (c) Matching between process and AID by emphasizing emerging problems and opportunities	Map of the flow of activities Reports where critical aspects of the data sequence were highlighted Demo visualization Software coding visualization Sketchs on a blank sheet Sketchs of the map of activities Sketchs on the AID schema	First release of AID
Implementation of AID	(a) Connecting data warehouse and people (c) Initialization process of AID (d) Compatibility test with OW	Screen dumps SW display	Process automation AID fails AID advantages

Source: personal elaboration.

3.2 Types of performative effect

Data analysis shows that the translation of an AI device for the measurement of ongoing multi-year contracts takes form by enabling a TCS where different accounting apparatuses interact each other and mobilize action. An apparatus is the assemblage of human agents, calculative device and *modus operandi*, that is an organizationally-consolidated way of thinking and acting with reference to a specific practice. When an innovative accounting technology is implicated in the performing of existing calculative practice, many apparatuses come into play and actively contribute to the occurrence of the translation process. In our study, different apparatuses intervene along with the developmental stage of the project by unleashing three performative effects: reflective, mediated and epistemic (table 3).

Reflective effect concerns the rationalization of cognitive structures by means of concretization and abstraction. Visual representations, for example the maps that represented the flow of activities of macro and micro processes for the evaluation of multi-year contract, the sketches on a blank sheet, the notes taken on the provisional accounting reports, facilitate the formalization of cognitive structures that are specific to the managers and consultants and construct the divergent expectations and beliefs through which actors define organisational their specific view of order. Managers and consultants' interpretation of the role, use and expected results of the implementation of AID are multiple, local and sometime conflicting institutional pressures for legitimacy. The formalization and simplification of the interpretations was useful to negotiate and integrate the specific cognitive structures underpinning the phases of the AID project and to draw the members of the teamwork into the change process, thereby contributing to make innovation a possible and concrete thing. Under this reflective and rational representation of the implementation, we recognized a first type of engagement that we define technical, because knowledge was framed incorporating reflections from different perspectives and analyzing the consistency of the interpretation of each member.

Table 4. Types of engagement.

Types	Performative effect	Social, material, semiotic features	Forms of engagement (example)	Phase
Technical	Reflective action Standardized input-output	Visual representations Symbolism	Refocusing by highlighting visual	1-4

	relationships Abstraction and concretization	Technical functions of objects	contents, erasing, renaming, moving content using different colors	
Networked	Connecting people inside and outside firm Connecting object with different functions Connecting people and objects	Sharing meaning and interpretations Discursive practices Interaction with accounting inscriptions and other materiality	Internal meeting Workshop with IT consultants Dialoguing about a provisional outcome	1-4
Generative	Advancement of the unfolding of the process	New knowledge generation Innovation-making and enabling	Unexpected changes emerging from try and error practice	1-4

Source: personal elaboration.

AID translation provided an effective process for understanding how reflective and epistemic engagement took place in addressing the reshaping of the multi-year contract evaluation. We confirm that a wide array of socio-material objects facilitates knowledge production because they act as a bridge between different cognitive structures and mobilize internal and external knowledge contents leading to a more comprehensive, interactive and generative development of the translation process. In our study, we recognize that the use of various visual accounting representations makes the cognitive structures of internal and external members formalized, then more “visible” to all the members of teamwork and facilitated both the exploitation and the exploration of knowledge for making translation successful. The exploitation of knowledge focused on the efficient way to rationalize the implementation of AID, with a strong focus on the main and qualified aspects of a operative problem (for example, how to link different data warehouse, how to use a larger amount of data, how to change reporting, ...). Such representations were shaped and then revisited working on the data that different types of engagement provided on specific aspects of the “means-end chain” (i.e. the circular relationships among business controller, project manager, project engineers and production for the advancement of a multi-year work order on a monthly basis). They emerged from negotiation activities directed to align the gaps between knowledge and objectives and thus represented the first step to take for the adjustments of existing accounting practice in order to gain an innovative evaluation process. The exploration of knowledge was manifested where the members of the teamwork tried to make sense of unstructured internal and external situations with the aim to gain insights in addressing the identification of emerging opportunities and orientate the translation process. The envisioning of unstructured alternative ways to gain a competitive advantage in the short and medium term, was conducted through an explorative practice of knowing where people challenged the existing frames of references and priorities. Here, the strategy formulation was encouraged by a continuously engagement in learning process that provided a shared sense-making around the new modes of actions by making the outcome of the reflexive practices visible and open to other members for discussion. This mode of making knowledge in a situated calculative space proved useful to enable innovation to move outside routine-based practices and to break down the *modus operandi* that constrain most of the changes into existing practices. The engagements played a central role for the enrollment of this evolutionary process and we appreciated their epistemic function, since changes in the calculative practices were conducted around the data delivered by AI device and guided by the fundamental questions stimulated by the combination of data.

4. Conclusion

We contribute to the advancement of the research field on the practice-based view of accounting (Ahrens, Chapman, 2004) by focusing on the different types of engagement to orchestrate complex processes of innovation technology translation. We show how the construction of something close to a coherent implementation, even in the presence of tensions, divergent understandings, and ill-defined issues, can be achieved through the fundamental role of socio-materials in the development of technical, networked and generative engagements (Busco, Quattrone, 2018; Cooper et al., 2019; Martinez, Cooper, 2019; Qu, Cooper 2011; 2017). Despite agency still depends on human actors, material artefacts play a critical role in these ensembles of knowledge practices, making AID translation open to transformation (Chia and Holt, 2006). Thus, the translation of an innovative accounting technology is not simply a matter of finding the right alignment and integration between existing calculative practices and the technical functions that the innovation is expected to deploy, but also a matter of socio-material engagements where artefacts, including different visual tools, are actively involved (Busco, Quattrone, 2018).

By providing an empirical illustration of how specific engagements take forms in the AID translation process, we advance an understanding of translation as a complex process. In particular, our findings highlight the

unfolding nature of knowledge processes in the translation process, as emergent, temporary, provisional and interactive accomplishments.

Finally, we contribute to the research on visual accounting inscriptions more specifically. Our findings suggest that visuals are multi-function artifacts that play a central role in the practices of people involved in the implementation of an AID as they shape a more comprehensive and generative articulation of the relevant problems. We find that the use of visualization produces impacts on the individual and organizational knowledge moving from exploitation to exploration. Visuals enable interactive sense-making around ill-defined and unknown problems allowing a swing from structured to unstructured practices and back, eventually moving from stability and order to dynamism and change. We confirm that visual accounting inscriptions facilitate knowledge production because they act as a bridge between different cognitive structures and mobilize internal and external knowledge contents leading to a more comprehensive, interactive and generative development of the translation process. While confirming this extant knowledge, we add a process perspective to the debate on the role of visual inscriptions. Indeed, we empirically illustrate the recursive dynamic between technical and epistemic engagements and show how they happen together. An engagement is not either technical or epistemic: both aspects co-occur and feed each other in the unfolding of the translation; it is rather an evolving process. Also, while technical and epistemic engagements recursively unfold, they are at the same time working as powerful boundary objects. We also add a nuance to the debate on visual artefacts, by highlighting that it is different aspects of the artefacts (namely, stabilized formats and open formats) that afford those different roles.

In conclusion, a few important implications may be derived from these findings. Adopting a practice lens can be important in orchestrating complex processes of new accounting technology translation that are inherently knowledge-based: the higher the complexity of the setting, the higher the complexity of knowledge dynamics, the greater the potential of the ensemble of different types of engagements. However, one may not simply import pre-established management tools in this context: this would be short-lived, because stabilized formats may work as technical objects only, formalizing knowledge, but missing opportunities to explore new opportunities. On the other hand, one may not rely on open formats only to visualize action, as these would lack the moment of stabilization of creative ideas. Accounting visuals are most useful if performed dynamically: alternating stabilized and open formats to maximize the technical, epistemic and networked potential that they bear.

References

- Arnold, V. (2006). Behavioral research opportunities: Understanding the impact of enterprises systems. *International journal of accounting information systems*, 7(1), 7-17.
- Baldwin, A. A., Brown, C. E., & Trinkle, B. S. (2006). Opportunities for artificial intelligence development in the accounting domain: the case for auditing. *Intelligent Systems in Accounting, Finance & Management: International Journal*, 14(3), 77-86.
- Bhimani, A. (1993). Indeterminacy and the specificity of accounting change: Renault 1898–1938. *Accounting, Organizations and Society*, 18(1), 1-39.
- Briers, M., & Chua, W. F. (2001). The role of actor-networks and boundary objects in management accounting change: a field study of an implementation of activity-based costing. *Accounting, Organizations and Society*, 26(3), 237-269.
- Busco, C., & Quattrone, P. (2015). Exploring how the balanced scorecard engages and unfolds: Articulating the visual power of accounting inscriptions. *Contemporary Accounting Research*, 32(3), 1236-1262.
- Busco, C., & Quattrone, P. (2018). Performing business and social innovation through accounting inscriptions: An introduction. *Accounting, Organizations and Society*, 67, 15-19.
- Charmaz, K. (2006). *Constructing grounded theory: A practical guide through qualitative research*, Sage Publications Ltd, London.
- Chia, R., & Holt, R. (2006). Strategy as practical coping: A Heideggerian perspective. *Organization Studies*, 27(5), 635-655.
- Chua, W. F., & Mahama, H. (2007). The effect of network ties on accounting controls in a supply alliance: field study evidence. *Contemporary Accounting Research*, 24(1), 47-86.
- Comi, A., Bischof, N., & J. Eppler, M. (2014). Beyond projection: Using collaborative visualization to conduct qualitative interviews. *Qualitative Research in Organizations and Management: An International Journal*, 9(2), 110-133.
- Cooper, D. J., & Ezzamel, M. (2013). Globalization discourses and performance measurement systems in a multinational firm. *Accounting, Organizations and Society*, 38(4), 288-313.
- Cooper, D. J., Ezzamel, M., & Qu, S. Q. (2017). Popularizing a management accounting idea: The case of the balanced scorecard. *Contemporary Accounting Research*, 34(2), 991-1025.
- Cooper, D. J., Ezzamel, M., & Robson, K. (2019). The Multiplicity of Performance Management Systems: Heterogeneity in Multinational Corporations and Management Sense-Making. *Contemporary Accounting Research*, 36(1), 451-485.

- Czarniawska, B. (2014). Why I think shadowing is the best field technique in management and organization studies, *Qualitative Research in Organizations and Management: An International Journal*, 9(1), 90-93.
- Deleuze, G. and Guattari, F. (1987). *A thousand plateaus: capitalism and schizophrenia*. University of Minnesota Press, Minneapolis MN.
- Glaser, B., and Strauss, A. (1967). *The Discovery of Grounded Theory*, Aldine Publishing Company, Hawthorne, NY.
- Langley, A. (1999). Strategies for theorizing from process data, *Academy of Management Review*, 24(4), 691-710.
- Li, Z., Zheng, L. (2018). The Impact of Artificial Intelligence on Accounting. *Advances in Social Science*, 181, 813-816.
- Luo, J., et al. (2018). Analysis of the Impact of Artificial Intelligence Application on the Development of Accounting Industry. *Open Journal of Business and Management*, 6, 850-856.
- Martinez, D. E., & Cooper, D. J. (2017). Assembling international development: Accountability and the disarticulation of a social movement. *Accounting, Organizations and Society*, 63, 6-20.
- Martinez, D. E., & Cooper, D. J. (2019). Assembling performance measurement through engagement, *Accounting, Organizations and Society*, <https://doi.org/10.1016/j.aos.2019.04.002>
- Miller, P., & Power, M. (2013). Accounting, organizing, and economizing: Connecting accounting research and organization theory. *The Academy of Management Annals*, 7(1), 557-605.
- Omoteso, K. (2012). The application of artificial intelligence in auditing: Looking back to the future. *Expert Systems with Applications*, 39(9), 8490-8495.
- Qu, S. Q., & Cooper, D. J. (2011). The role of inscriptions in producing a balanced scorecard. *Accounting, Organizations and Society*, 36(6), 344-362.
- Quattrone, P. (2009). Books to be practiced: Memory, the power of the visual, and the success of accounting. *Accounting, Organizations and Society*, 34(1), 85-118.
- Quattrone, P. (2016). Management accounting goes digital: Will the move make it wiser?. *Management Accounting Research*, 31, 118-122.
- Quattrone, P., & Hopper, T. (2005). A 'time-space odyssey': management control systems in two multinational organisations. *Accounting, Organizations and Society*, 30(7-8), 735-764.
- Rikhardsson, P., & Yigitbasioglu, O. (2018). Business intelligence & analytics in management accounting research: Status and future focus. *International Journal of Accounting Information Systems*, 29, 37-58.
- Rose, N. (1999). *Powers of freedom: Reframing political thought*. Cambridge university press.
- Suhaimi, A., Syida, N., Nawawi, A., Salin, P., & Azlin, S. (2016). Impact of Enterprise Resource Planning on Management Control System and Accountants' Role. *International Journal of Economics & Management*, 10(1), 93-108.
- Sutton, S. G., Holt, M., & Arnold, V. (2016). "The reports of my death are greatly exaggerated"—Artificial intelligence research in accounting. *International Journal of Accounting Information Systems*, 22, 60-73.