2.2 Management Studies

Chair: Eleni Papadonikolaki (University College London)

Feloutzis Nikolaos Athens University of Economics and Business	Blockchain Adoption in Greece: which are the resources needed? Which is the role of dynamic capabilities?
Mitsiou Dimitra University of Macedonia	The EFQM Model as a Total Quality Management-based Assessment Framework in the Public Sector Services of Greece
Vasilatos Antonios University of Piraeus	The Implementation of IAS 38 in Greece: which determinants drive management to capitalize R&D costs and how their choice affects future firm performance?
Zygouris Fotios University of Macedonia	The Development of a Functional Model of Knowledge Management in the Public Sector in Greece

Presentation's cover page

PhD Symposium: The 10th HO PhD Symposium on Contemporary Greece and Cyprus

Date: 26 May 2023

University: London School of Economics and Political Science (LSE)

Paper's title:

Blockchain adoption in Greece: Which are the resources needed? Which is the role of the dynamic capabilities?

PhD candidate: Nikolaos Feloutzis

Supervisor: Prof. Georgios Lekakos

University: Athens University of Economics and Business (AUEB)

Department: Management Science and Technology (DMST)

PhD research scope: Blockchain technology from the perspective of organizations

Presentation's agenda

Research questions examined:

a) What is blockchain technology?

b) Which is the business value of blockchain?

c) Which are the barriers to blockchain adoption in Greece?

d) Which are the resources required for blockchain adoption in Greece?

e) Which are the dynamic capabilities required for blockchain adoption in Greece?

f) How will the competitive advantage be accomplished in the forthcoming blockchain-based era?

The theories that the analysis is based on:

a) Resource Based View (RBV)

b) Dynamic Capabilities (DC)

Research Methodology:

a) Literature review

b) Semi-structured interviews with Greek blockchain experts

What is blockchain technology?

According to Glasser (2017), Blockchain is defined as **'a decentralized transactional database technology that facilitates validated, transparent-resistant transactions that are consistent across a huge number of network participants called nodes'** (Beck *et. al.* 2018: 1021).

Blockchain is a set of component technologies. In particular, it consists of two broad groups of technologies (Rauchs *et. al*. 2019):

1. Cryptographic primitives:

digital signatures

cryptographic hashing functions

timestamping

merkle trees

2. Distributed systems:

P2P networking

message passing protocols

consensus algorithms

distributed databases

Basic blockchain concepts: cryptocurrencies, smart contracts, ICOs, NFTs, Dapps, DAOs

Which are the benefits of blockchain technology?

The main benefits of blockchain: decentralization, efficiency, auditability, traceability, transparency and security (Niranjanamurthy *et. al.* 2019)

Yet, its most spectacular advantage is that it constitutes a **versatile** technology (Casino *et. al.* 2019)

Banking: refined KYC process, reduced cost, decreased time needed for the completion of cross border payments, decreased burden of bureaucracy in the syndicated loans, single source of truth to the stakeholders in the trade finance (Daluwathumullagamage and Sims 2021)

Shipping: real time information to all the participants, protection of critical documents from being tampered, automated execution of essential steps (e.g., payments) through smart contacts (Jović *et. al.* 2019)

Social goals: the mitigation of the plastic waste problem (Steenmans *et. al.* 2021) and the enhancement of charitable activities (Christie 2020)

Companies hesitate to adopt blockchain

A lot of managers **hesitate to adopt blockchain** by taking into consideration diverse barriers like (Sadhya and Sadhya 2018):

a) shortage of knowledge
b) regulatory issues
c) energy consumption
d) immaturity of the technology

Many **blockchain projects have failed** due to various reasons, such as (Disparte 2019):

a) lack of vision
b) the fact that blockchain does not dovetail with the legacy systems

The degree of blockchain adoption in Greece:

The E.U. Blockchain Observatory and Forum (2020) compared the counties of European Union concerning their blockchain-related activity based on **two axes:**

a) Legislative framework's maturity
b) Ecosystem's maturity

In line with the results, **Greece presented low scores in both dimensions.**

Blockchain adoption in Greece

Considering the blockchain-related literature pertaining to the Greek territory, there is an **extremely small number of publications**. A common finding is that the degree of blockchain adoption in Greece is **very low**.

Reference	Context	Main findings
(Papathanasiou *et. al.* 2020)	Shipping industry	**Motives to blockchain adoption:** a) consistency, b) efficiency, c.) security **Barriers to blockchain adoption:** a) complexity, b) culture, c) insecurity, d) fatigue and disappointment emanating during the adoption of ERP
(Ntanos *et. al.* 2020)	Greek accountants	**Low level of familiarity:** a) 21% of respondents are not at all familiar with blockchain and b) 41% are slightly familiar with blockchain
(Kapnissis G. *et. al.* 2022)	Shipping industry	**Factors that affect positively the intention to adopt blockchain:** a) social influence b) trust **Factors that do not exert any influence on the intention to adopt blockchain:** a) performance expectancy, b) blockchain functional benefits Possible interpretation: unfamiliarity with blockchain and its properties
(Xathopoulou 2022)	Public services	**Five categories of obstacles:** a) current organizational culture, b) shortage of resources, c) inexistent strategy, d) unsuitable leadership, e) missing skills and training

Resource Based View (RBV)

The RBV theory was introduced by Wernerfelt (1984)

VRIN framework: valuable, rare, imperfectly imitable, non substitutable (Barney 1991)

VRIO framework: valuable, rare, imperfectly imitable (non substitutable), organization's capability (Barney 1995)

IT is not a standalone resource (Bharadwaj 2000; Caldeira and Ward 2003; Mata et. al. 1995;)

Weaknesses of RBV:

a.) It is a static analysis (Teece *et. al.* 1997)

b.) It does not inform managers about how they can build the strategic resources (Priem and Butler 2001)

Dynamic Capabilities (DC)

The DC theory was introduced by Teece *et. al.* (1997)

In line with Helfat *et. al.* (2007:4), the dynamic capabilities are defined as **'the capacity of an organization to purposefully create, extend, or modify its resource base'**

Three broad classes of dynamic capabilities (Teece 2007): sensing, seizing, transformation

Within the literature body of dynamic capabilities, the IT plays **four roles** (Steininger *et. al.* 2022):

a.) enabler, b.) embedded in, c.) context, **d.) outcome/mediator**

Dynamic capabilities needed for IT adoption:

For example, a.) innovative (e.g., the rapid formulation of strategy, the development of business cases) and b.) integrative (e.g., the integration of new IT systems with existing ones, the alignment between IT strategy with corporate strategy) (Daniel and Wilson 2003)

Blockchain through the lens of RBV and DC

Regarding the literature body that explicates blockchain through the lens of RBV and DC, **the core research questions analyzed are the following three:**

Research questions	Related publications
Is blockchain a strategic resource (VRIN/ VRIO framework)?	**Complementary resources are needed:** employee know-how, founders' prior experience (Bjørnstad et. al. 2017) visionary leadership, experience, cryptocurrency token, open source (Jain 2020)
Which are the resources and the dynamic capabilities required for successfully adopting blockchain technology?	**Resources and dynamic capabilities encouraging blockchain adoption:** Internal leadership and human resources capability (Li *et. al.* 2022) Absorptive capacity (Wamba and Queiroz 2022) Managerial Capability and innovation capability (Dwivedi *et. al.* 2023)
How does blockchain increase the organization's performance?	**Blockchain increases firm's performance indirectly through the enhancement of some capabilities:** two operational (information sharing, coordination) and two strategic (integration, collaboration) capabilities (Nandi *et. al.* 2020) the firm's expected future performance (Tobin's Q) (Sharma *et. al.* 2023)

Semi-structured interviews

The six steps proposed by Rabionet (2021) were executed:

Step	Short description
1. Selecting the kind of interview	Semi-structured interviews
2. Establishing the ethical guidelines	Notification that the conversation is recorded, anonymity
3. Crafting the interview protocol	Questions pertain to 3 stages of adoption: a.) pre-adoption b.) adoption process c.) post-adoption
4. Conducting and recording the interview	Twelve interviews were conducted through the Microsoft Teams
5. Analyzing and summarizing the interview	'Theoretical' thematic analysis (Braun and Clarke 2006)
6. Reporting the findings	Within the next slides, the key findings are described.

Categories of interviewees:

a.) providers

b.) adopters

c.) promoters

Interviewees

Participant	Position in the market	Year of establishment	Context
A	Provider	2021	Journalism
B	Provider	2020	Blockchain Research team
C	Provider	2022	Supply chain
D	Provider	2020	Supplier of blockchain-related products
E	Provider	2021	Offering blockchain-based solutions
F	Provider	2022	NFTs
G	Provider	2021	Networking
H	Provider	2018	Ticketing solution
I	Provider	2019	Offering blockchain-based solutions
J	Promoter	2020	Educational institution
K	Promoter	2017	Columnist, trainer, author
L	Adopter	2021	Public services

Which are the barriers to blockchain adoption in Greece?

By analyzing the interviews data, it is found that the categories of barriers correspond to the four factors of **PEST analysis** (Aguilar 1967):

Political: lack of relevant legislative framework in Greece due to the following reasons:

a) The regulators' difficulty of understanding blockchain

b) The regulators' intention to exert control over the society

Economic:

Shortage of blockchain developers, inexistence of suitable training programs, failed projects

Social:

Unwillingness to spend time on learning about blockchain, corruptive practices

Technological:

Low maturity of blockchain technology, low degree of digital transformation in Greece

Which are the resources required for blockchain adoption in Greece?

Adopters:

Tangible:

Financial capital, organization's degree of digitalization, quality of organization's products

Human:

IT department being capable of understanding blockchain, blockchain training, a project manager acting as a product champion

Intangible:

Intention to learn, willingness to collaborate

Providers:

Tangible:

Adequate technological infrastructure, high financial capital, blockchain-as-a-service platform

Human:

Blockchain developers, big variety of professionals, relational capabilities

Intangible:

Attitude to learn, the appropriate business model

Which are the dynamic capabilities required for blockchain adoption in Greece?

Adopters:

a) Predicting quickly the resource needs and always hiring the appropriate candidates

b) Managing a team in which neither the leader nor the members have the adequate knowledge for predicting what the next steps will be

c) Being capable of recognizing the suitable manners through which they can capitalize on blockchain-based products

d) Being willing to experiment with blockchain-based solutions by altering their evaluation criteria and the process of decision-making

e) Planning a new strategy and modifying their structure

Providers:

a) Predicting quickly the resource needs and always hiring the appropriate candidates

b) Sensing the market and predicting the areas of high demand in the future

c) Understanding the real needs of their customers

d) Expanding the network of their partners

e) Adapting properly their business model

How will the competitive advantage be accomplished in the forthcoming blockchain-based era?

Adopters:

a) First mover advantage
b) Vision
c) Human talent
d) The content of blockchain-based products (e.g., NFTs)
e) The exploitation of the data recorded in the blockchain

Providers:

a) User-friendly blockchain-based solutions
b) Creation of new blockchain use cases
c) Combination of blockchain with other technologies
d) Capability of approaching big customers
e) Interoperability of blockchain networks
f) Quantum-proof blockchains

The contributions of the research paper

Contributions:

a) Investigating the adoption of blockchain in **Greece** by explicating the view of **both providers and adopters**

b) Detecting some **dynamic capabilities** which have not been discussed within the blockchain-related literature until now

c) Predicting how the **competitive advantage** will be acquired in the upcoming blockchain-based era

Thank you

Do you have any questions?

Some famous blockchain quotes:

"Blockchain is the biggest opportunity set we can think of over next decade or so" (Bob Greifeld, Nasdaq Chief Executive).

"Bitcoin is a remarkable cryptographic achievement, and the ability to create something that is not duplicatable in the digital world has enormous value"(Eric Schmidt, C.E.O. of Google).

"Anything that can conceive of as a supply chain, blockchain can vastly improve its efficiency- it doesn't matter if it is people, numbers, data, money" (Ginni Rometty, C.E.O. of I.B.M.).

References (1)

Aguilar, Francis, Joseph (1967). Scanning the business environment. New York: MacMillan Co.

Barney, J.B. (1991). 'Firms resources and sustained competitive advantage', *Journal of Management*, 17:1, 99 – 120.

Barney, J. B. (1995). 'Looking inside for competitive advantage', *The Academy of Management Executive*, 9:4, 49-61.

Beck, R., Müller-Bloch, C. and King J.L. (2018). 'Governance in the Blockchain Economy: A Framework and Research Agenda', *Journal of the Association for Information Systems*, 19:10, 1020-1034.

Bharadwaj, A.S. (2000). 'A resource-based perspective on information technology capability and firm performance: An empirical investigation'. *MIS Quarterly*, 19:4, 487-505.

Bjørnstad, Magnus Vitsø, Harkestad, Joar Gunnarsjaa, and Krogh Simen (2017). 'A study on blockchain technology as a resource for competitive advantage'. Master's Thesis, Master of Science in Enterpreunership, Norwegian University of Science and Technology.

Braun, V., and Clarke V. (2006). 'Using thematic analysis in psychology'. *Qualitative Research in Psychology*, 3:2, 77-101.

Caldeira, M.M. and Ward J.M. 'Using Resource-Based Theory to interpret the successful adoption and use of information systems and technology in manufacturing small and medium-sized enterprises', *European Journal of Information Systems*, 12:2, 1159-1169.

Casino, F., Dasaklis, T.K., and Patsakis C. (2019). 'A systematic literature review of blockchain-based applications: Current status, classification and open issues', *Telematics and Informatics*, 36, 55–81.

Christie, A. (2020). 'Can distributed ledger technologies promote trust for charities? A literature review', Frontiers in Blockchain, 3, 31.

References (2)

Daluwathumullagamage, D.J., and Sims A. (2021). 'Fantastic Beasts: Blockchain Based Banking', Journal of Risk and Financial Management, 14:4, 170.

Daniel, E.M. and Wilson H.N. (2003). 'The role of dynamic capabilities in e-business transformation', European Journal of Information Systems, 12:4, 282-296.

Disparte, D. A. (2019). 'Why Enterprise Blockchain Projects Fail'. Forbes, 20 May.

Dwivedi, Y.K., Balakrishnan, J., Das, R., and Dutot V. (2023). 'Resistance to innovation: A dynamic capability model based enquiry into retailers' resistance to blockchain adaptation'. Journal of Business Research, 157, 113632.

E.U. Blockchain Observatory and Forum (2020). EU Blockchain Ecosystem Developments, available at https://www.eublockchainforum.eu/sites/default/files/reports/EU%20Blockchain%20Ecosystem%20Report_final_0.pdf (accessed on 20 April 2023).

Helfat, Constance E., Finkelstein, Sydney, Mitchell, Will, Peteraf, Margaret A, Singh, Harbir, Teece, David J., and Winter Sidney G. (2007). Dynamic Capabilities: Understanding Strategic Change in Organizations. Malden (Massachusetts): Wiley-Blackwell.

Jain, P. (2020). 'Converting Blockchain into a Strategic Resource'. *International Journal of Advance Science and Technology*, 29:5, 1850 – 1861.

Jović, M., Filipović, M., Tijan E., and Jardas M. (2019). 'A Review of Blockchain Technology Implementation in Shipping Industry', Scientific Journal of Maritime Research, 33:2, 140-148.

Kapnissis, G., Vaggelas G.K., Leligou, H.C., Panos, A. and Doumi M. (2022). 'Blockchain adoption from the Shipping Industry: An empirical study', *Maritime Transport Research,* 3, 100058.

References (3)

Li, X., Zhou, Y., and Yuen, K.F. (2022). 'Blockchain implementation in the maritime industry: critical success factors and strategy formulation'. *Maritime Policy & Management*.

Mata F. J., Fuerst, W. L. and Barney J.B. (1995). 'Information Technology and Sustained Competitive Advantage: A Resource-Based Analysis'. *MIS Quarterly*, 19:4, 487-505.

Nandi, M.L., Nandi, S., Moya, H., and Kaynak H. (2020). 'Blockchain technology-enabled supply chain systems and supply chain performance: a resource-based view'. *Supply Chain Management: An International Journal*, 25:6, 841-862.

Niranjanamurthy, M., Nithya, B.N. and Jagannatha S. (2019). 'Analysis of Blockchain technology: pros, cons and SWOT', *Cluster Computing*, 22, 14743-14757.

Ntanos, A. et al. (2020). 'Blockchain technology: A case from Greek accountants', in A. Kavoura, E., Kefallonitis, and P. Theodoridis (eds) Strategic Innovative Marketing and Tourism. Springer Proceedings in Business and Economics: Springer, 727-735.

Papathanasiou, A., Cole, R. and Murray P. (2020). 'The (non-) application of blockchain technology in the Greek shipping industry', *European Management Journal*, 38, 927-938.

Priem, R. L. and Butler J. E. (2001). 'Tautology in the Resource-Based View and the Implications of Externally Determined Resource Value: Further Comments', *The Academy of Management Review*, 26:1, 57-66.

Rabionet, S.E. (2011). 'How I learned to design and conduct semi-structured interviews: An ongoing and continuous journey'. *The qualitative Report*, 16:2, 563-566

Rauchs, Michel, Blandin, Apolline, Bear, Keith and McKeon Stephen (2019). '2ND Global Enterprise Blockchain Benchmarking Study', available at https://www.jbs.cam.ac.uk/wp-content/uploads/2020/08/2019-10-ccaf-second-global-enterprise-blockchain-report.pdf (accessed on 20 April 2023).

.

References (4)

Sadhya, Vikram and Sadhya Harshali (2018). 'Barriers to Adoption of Blockchain'. 24th Americas Conference on Information Systems, New Orleans.

Sharma, P., Shukla, D.M., and Raj A. (2023). 'Blockchain adoption and firm performance: The contingent roles of intangible capital and environmental dynamism'. *International Journal of Production Economics*, 256, 108727.

Steenmans, K., Taylor, P., and Steenmans I. (2021). 'Blockchain technology for governance of plastic waste management. Why are we?', *Social Sciences*, 10: 434.

Steininger, D. M., Mikalef, P., Pateli, A. G. and Ortiz de Guinea A. (2021). 'Dynamic Capabilities in Information Systems Research: A Critical Review, Synthesis of Current Knowledge, and Recommendations for Future Research', *Journal of the Association for Information Systems*, forthcoming.

Teece, D.J., Pisano, C. and Shuen A. (1997). 'Dynamic Capabilities and Strategic Management', *Strategic Management Journal* 18:7, 509 – 533.

Teece, D.J. (2007). 'Explicating Dynamic: The nature and microfoundations of (sustainable) enterprise performance', *Strategic Management Journal*, 28:13, 1319- 1350.

Wamba, S.F., and Queiroz M.M. (2022). 'Industry 4.0 and the supply chain digitalization: a blockchain diffusion perspective'. *Production Planning & Control*, 33:2-3, 193-210

Wernerfelt, B. (1984). 'A Resource-Based View of the Firm'. *Strategic Management Journal*, 5:2, 171-180.

Xathopoulou, P. (2022). 'Blockchain and digital transformation of the public sector: The Greek experience'. *Technium Social Sciences Journal,* 32, 558-570.

The EFQM Model as a Total Quality Management-based Assessment Framework in the Public Sector Services of Greece

Dimitra Mitsiou
Ph.D. Candidate
University of Macedonia
Department of International and European Studies

HELLENIC REPUBLIC
UNIVERSITY OF MACEDONIA

Purpose of the paper

- To explore the existing body of literature on whether the EFQM model has been applied as an assessment framework in public sectors services in Greece

- To identify, analyze, assess and synthesize all available studies through a systematic literature review

- To identify if a research gap exists in literature

Introduction

Public Sector Services are called to:

- **overcome diverse emerging challenges**
- **achieve quality results and ensure operational excellence**
- **adopt a new philosophy to fulfill their decisive role for the country's economic and social development.**

Introduction

Total Quality Management is the philosophy which:

- **aims at the continual improvement of the organization's efficiency and effectiveness (Chen et al. 2016)**

- **focuses on the provision of quality services aligned with the customers' needs (Janakiraman and Gopal 2006)**

Introduction

Total Quality Management is the philosophy that:

- **can be applied to organizations of the private and public sector (Enggartyasti and Caraka 2017)**

- **serves as the base for the concept Excellence and for a vast number of Models (Porter and Tanner 2004).**

Introduction

The EFQM Model:

- **was developed and introduced by the European Foundation for Quality Management in 1991 (Fonseca et al. 2021)**

- **is designed based on the characteristics of the socio-economic environment of Europe (Oger and Platt 2002)**

Introduction

The EFQM Model has been:

- **widely adopted and applied at a European level (van Schoten et al. 2016)**

- **adapted for the public sector (Gené-Badia et al. 2001)**

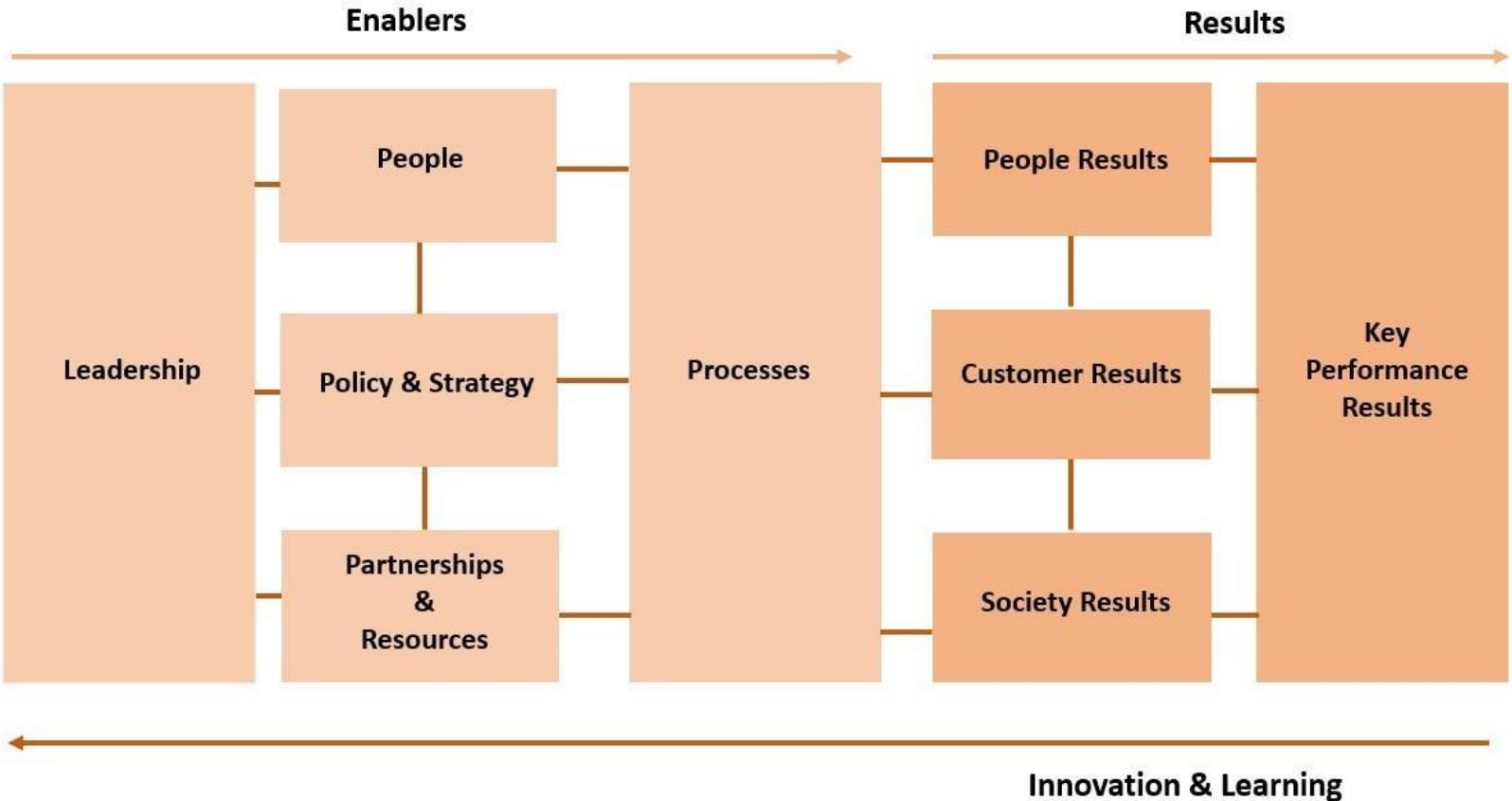
Introduction

The EFQM Model:

- **is regularly revised (Santos-Vijande and Alvarez-Gonzalez) to address global challenges and stay updated**
- **The older versions consisted of 9 criteria classified in 2 groups called Enablers and Results**
- **the newest version consists of 7 criteria divided into 3 groups called Direction, Execution and Results**

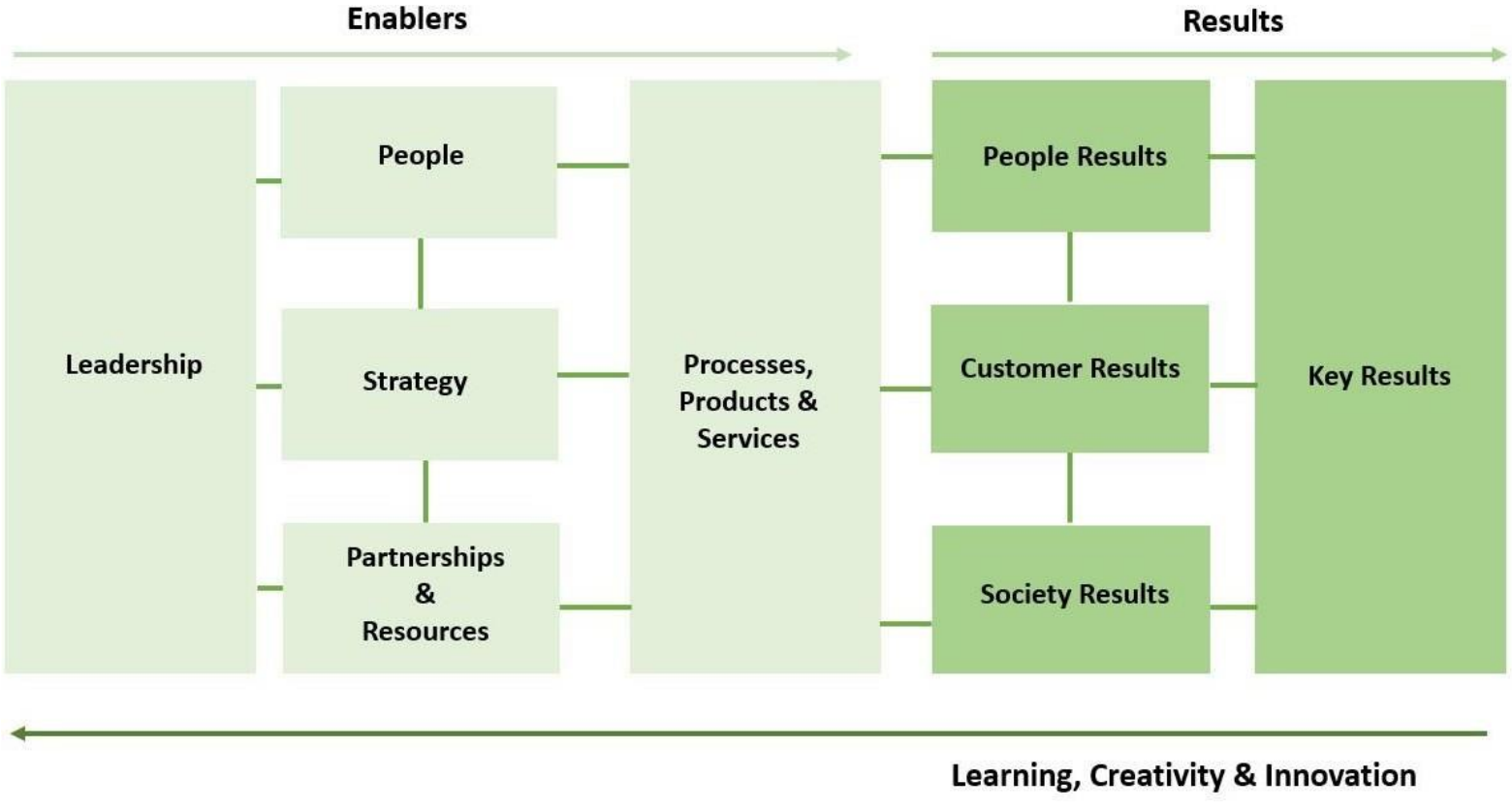
Introduction

EFQM Model 2003



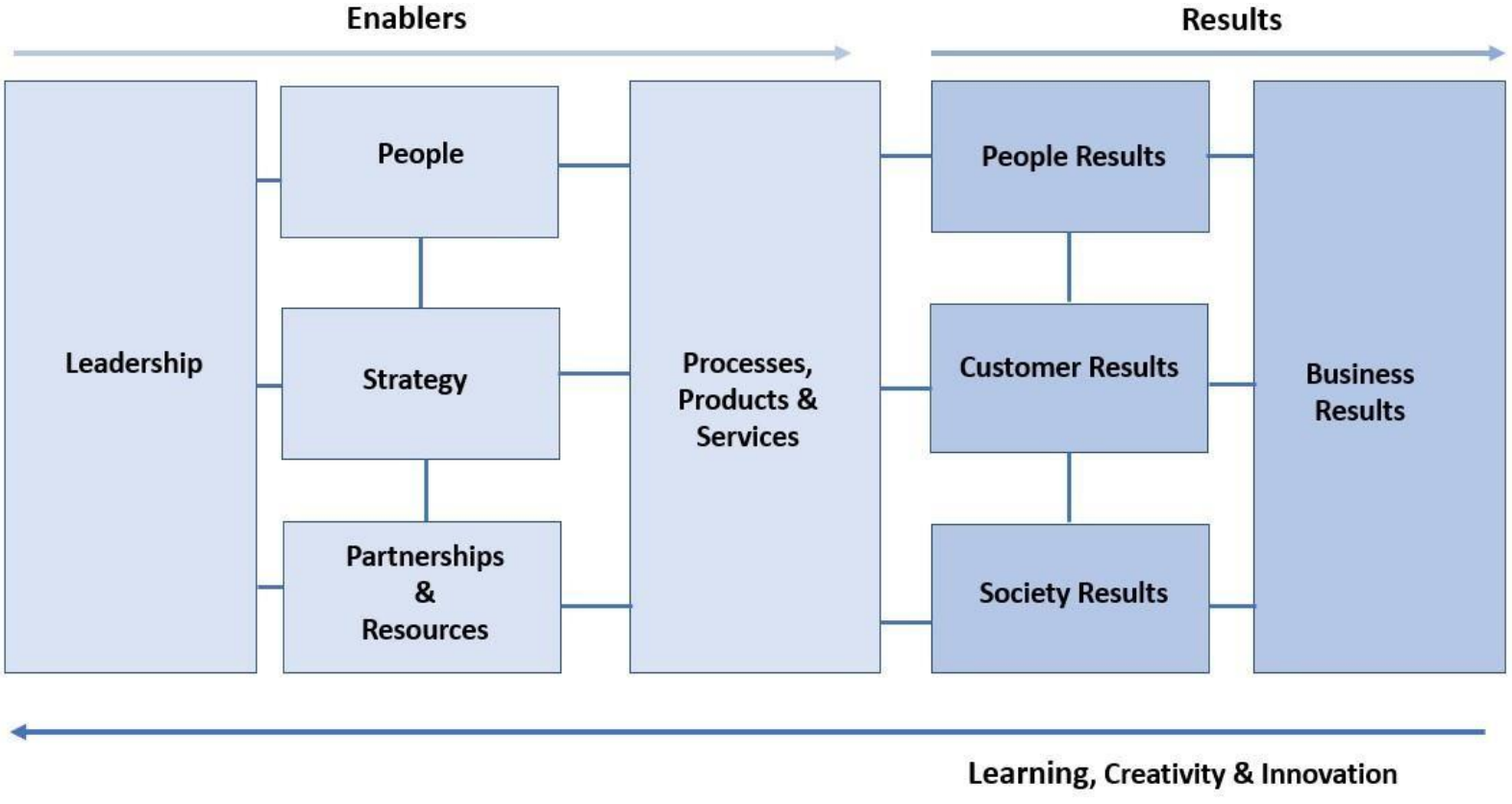
Introduction

EFQM Model 2010



Introduction

EFQM Model 2013



Introduction

EFQM Model 2020

Source: EFQM 2021:10

Methodology

The paper follows the systematic literature review methodology:

Step 1 Define the Research Question

“Has the EFQM model been applied as an assessment framework in Greek public sector services?”

Methodology

Step 2 Develop the review protocol

- Application of the SPIDER tool (Cooke et.al 2012) to generate the search terms

SPIDER Tool	Search Terms
S – Sample	"Greek public sector" OR "Greek public sector services" OR "Greek public organisations"
PI – Phenomenon of Interest	"EFQM model assessment" OR "EFQM assessment framework" OR "EFQM evaluation framework"
D – Design	"questionnaire" OR "survey" OR "case study"
E – Evaluation	"opinions" OR "views" OR "attitudes" OR "perceptions"
R – Research type	"quantitative " OR "mixed methods"

Methodology

Step 2 Develop the review protocol

- Application of the SPIDER tool to define the Inclusion and exclusion criteria

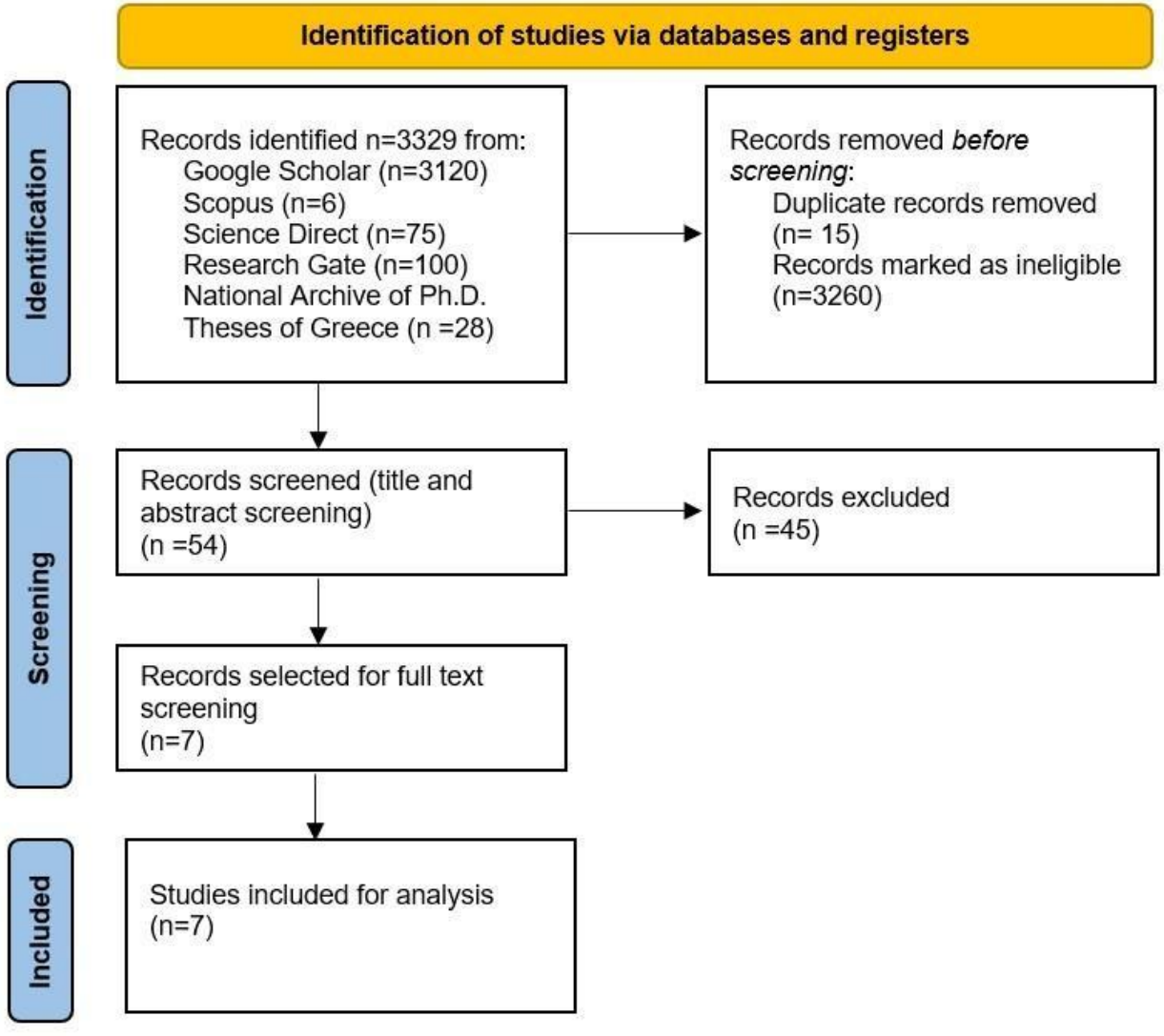
- Selection of databases

- 4 electronic databases (Scopus, Science Direct, Research Gate, Google Scholar)
- Grey literature (National Archive of Ph.D. Theses)

Methodology

Step 3

Identification of literature



PRISMA flow diagram adapted by Page et al. (2021)

Methodology

Step 4 Assessment of Studies

- Studies were assessed in terms quality of research methodology
- No exclusions were made based on quality

Step 5 Data Extraction

- A standardized data extraction form was used

Step 6 Data Analysis and Synthesis

Results

The 7 papers included in the analysis

- were published from 2014 to 2022
- 3 papers were written in Greek, 4 papers in English
- 5 papers focused on services of primary, secondary or tertiary education
- only 2 papers focused on other type of public sector services
- 5 large scale & 2 case studies

Results

Study's Participants

- teachers (3 studies)
- school principals (1 study)
- administrative employees (2 studies)
- university students (1 study)

Version of the EFQM model

- 2003 EFQM model (6 studies)
- 2013 EFQM model (1 study)

Results

Methods of Statistical analysis

- descriptive statistics (2 studies)
- inferential statistical analysis (1 study)
- Factor Analysis, Principal Components Analysis & Implicative Statistical Analysis (3 studies)
- Structural Equation Modeling (2 studies), one in combination with descriptive statistics

Conclusion

- ✓ The EFQM Model has been used in public sector services in Greece
- ✓ The number of studies is extremely limited
- ✓ No Large-scale research outside the education area
- ✓ The 2020 EFQM model has not yet been applied probably due to its novelty
- ✓ A research gap in the exists literature

Thank you!

References

Chen, C. K., Anchecta, K., Lee, Y. D., and Dahlgaard J. J. (2016). 'A stepwise ISOBased TQM implementation approach using ISO 9001:2015', *Management and Production Engineering Review*, 7:4, 65–75

Cooke, A., Smith, D., and Booth A. (2012). 'Beyond PICO: the SPIDER tool for qualitative evidence synthesis', *Qualitative Health Research*,10, 1435-43

European Foundation for Quality Management (2021). The EFQM Model, EFQM, available at https://efqm.org/the-efqm-model/ (Accessed April 24, 2023)

Enggartyasti, A., and Caraka R. E. (2017). 'A Preview of Total Quality Management (TQM) in Public Services', *E-Jurnal Ekonomi dan Bisnis Universitas Udayana*, 6:9, 3285-90

Fonseca, L., Amaral, A., and Oliveira J. (2021). 'Quality 4.0: The EFQM 2020 Model and Industry 4.0 Relationships and Implications', *Sustainability*, 13, 1-20

Gené-Badia, J., Jodar-Solà, G., Peguero-Rodríguez, E., Contel-Segura, J.C., and Moliner-Molins C. (2001). 'The EFQM excellence model is useful for primary health care teams', *Family Practice*, 18:4, 407-09.

Janakiraman, B., and Gopal R.K. (2006). *Total Quality Management. Text and Cases*. New Delhi: Prentice-Hall of India Private Limited

Oger, B., and Platt D. (2002). 'Value Measurement and Value Creation Models in Europe and the US: A Comparison of the EFQM Excellence Model and the Baldrige Award Criteria', *Comptabilité -Contrôle- Audit*, 8:3, 99-115

Page, M.J., McKenzie, J.E., Bossuyt, P.M., Boutron, I., Hoffmann, T.C., Mulrow C.D., Shamseer, L., et al. (2021). 'The PRISMA 2020 statement: an updated guideline for reporting systematic reviews', *BMJ*, 372:n71,1-9

References

Porter, Les, and Steve Tanner (2004). *Assessing Business Excellence. A guide to business excellence and self-assessment*. Amsterdam: Elsevier

Santos-Vijande, M. L., and Alvarez-Gonzalez L. I. (2007). 'TQM and firms performance: An excellence model research based survey', *International Journal of Business Science and Applied Management*, 2:2, 21-41

van Schoten, S., de Blok, C., Spreeuwenberg, P., Groenewegen, P., and Wagner C. (2016). 'The EFQM Model as a framework for total quality management in healthcare: Results of a longitudinal quantitative study', *International Journal of Operations & Production Management*, 36:8, 901-22

The implementation of IAS 38 in Greece: Which determinants drive management to capitalize R&D costs and how their choice affects future firm performance?

Georgios A. Papanastasopoulos*[1] and Antonios M. Vasilatos †‡[2]

[1,2]Department of Business Administration, University of Piraeus, 80, Karaoli & Dimitriou, Piraeus, 18539, Greece

Abstract

We examine whether the accounting treatment of R&D is a credible signal for the firm's future performance, both operating and financial. We examine Greek listed firms, which report under IFRS. IAS 38 imposes capitalization of R&D projects that are expected to be successful. We provide evidence that firms classified as capitalizers are larger, more leveraged and less profitable than those that expense R&D. We find that capitalizers capitalize when they want to beat last year's income benchmark. We show that capitalization is negatively or neutrally associated with future performance. In addition to that, we show that when firms capitalize and expense R&D at the same time, the expensed part of R&D costs is positively associated with future performance. Although we cannot explicitly prove that managers capitalizes to manage earnings, the findings suggest that capitalization is not a credible signal for future superior firm performance. Our findings are in contrast with past literature supporting that R&D capitalization is an indication of better future performance.

*Supervisor

†corresponding author

‡PhD student

1 Introduction

Taking under consideration the fact that in some firms, intangible assets not only consist of an important percentage of the total assets but also, in many cases they affect firm value more compared to tangibles, it is an important area to examine and research. In addition to that, evidence from the US market suggests that there is a failure in reflecting intangibles in the financial statements (Lev and Gu 2016). Even though their research is in the US setting, their results are expanded in firms that report under IFRS, where R&D capitalization not only is permitted, but imposed by IAS 38 when certain requirements are met (Zéghal and Maaloul 2011).

So, there is a dichotomy on whether managers should be given the flexibility to choose the accounting treatment of R&D. This dichotomy is really important in the R&D literature, and it is our motivation for this paper. We can distinguish two schools of thinking in the literature regarding this issue. Those who are in favour of capitalization argue that this reporting choice acts as a signal and it is used by the management to convey information about future performance (Lev and Zarowin 1999). On the other hand, other researchers have shown that capitalization is used for earnings management or as an effort to conceal R&D investments, which are likely to fail in the future (Prencipe et al. 2008).

The purpose of our study is twofold; First we seek to answer if capitalization of R&D is used by managers to manipulate their earnings, and second, if capitalization conveys any information about the firms' future performance. We try to answer this questions by using a sample of Greek listed firms that report R&D activity in their financial statements (capitalization or expense). We choose Greek firms, because those research questions are unexplored in the Greek setting and because listed firms in Greece report R&D under IAS 38, under which R&D projects that are likely to be successful in the future must be capitalized.

To address these research questions we perform two analyses. First, we seek to find what are the determinants of R&D capitalization, in other words, what are the firm characteristics that lead to capitalization. We classify firms as expensers when they expense all of their R&D costs (they report only expensed R&D in the subsequent year) and as capitalizers when they report capitalized R&D (some of the capitalizers report both expensed and capitalized R&D). At the second stage of our analysis, we examine the relationship between capitalization and future performance. We expect to find a positive relationship between them if management indeed capitalizes R&D under IAS 38. We follow the suggestion of Ronen (2001) and we use accounting ratios as proxies for firm performance.

The examined period ranges from 2005 to 2020. Our sample includes 650 firm-year observations (70 R&D active, listed firms). We notice that 70% of our sample has never capitalized R&D expenditures, while the remaining 30% has capitalized at least once during the examined period. We perform the capitalization determinants test by estimating a Probit regression. We find that firms that capitalize differ from firms that expense in terms of assets size, leverage and financial performance. Our findings are supportive of the theory that capitalization is used to manage earnings, as we provide evidence that capitalization occurs when there is poor performance and when management wishes to beat last year's income benchmark.

The second part of our analysis, strengthens the earnings management indications we have obtained from the determinants model. We find a negative relationship between the decision to capitalize and future performance in one out of two models we have tested. Furthermore, we find a statistically significant relationship of the expensed R&D of capitalizers and not of the capitalized proportion. We also examine the issue of self-selection bias. Several researchers in the past have recognized this issue in their studies (Shehata 1991; Cazavan-Jeny and Jeanjean 2006). We follow their suggested solutions and we re-estimate our models. Correcting for self-selection bias has strengthen our results. In overall, our results indicate that either IAS 38 and its mandatory capitalization (under requirements) fails its main scope or that managers are unable to identify R&D projects that will be successful in the future and will bring future economic benefits in their firms.

The remainder of this paper is structured as follows. In Section 2, the hypotheses are developed. In Section 3 we describe the sample. In Section 4 the empirical analysis and results are presented, and finally, in Section 5 we present our final remarks.

2 R&D accounting treatment and hypotheses

There are two possible accounting treatments for R&D costs. Either they are immediately expensed, or they are capitalized as an intangible asset in the balance sheet. Both major accounting principles US GAAP (SFAS 72) and IFRS (IAS 38) mandate that R&D costs must be expensed. Their main difference is that under IAS 38, R&D activity is distinguished in two distinctive phases, research phase and development phase. In the research phase, all occurred costs are expensed, like US GAAP. In the development phase, if the criteria for intangible asset recognition are met, then the costs must be capitalized. These criteria, in

general, require the firm to prove that the asset will be completed and will generate future economic benefit to the firm. In contrast, before the introduction of IFRS, local GAAP in countries like the UK, France and Italy, allowed firm's management to decide whether development phase costs will be capitalized. The capitalization criteria were almost identical to current IAS 38 criteria for intangible assets recognition. The specific difference between IFRS and the local GAAP used before IFRS introduction in 2005, is the limitation of management's discretion in the latter.

Evidence suggests that stakeholders prefer the immediate expensing of R&D costs (Al-Horani et al. 2003). Published literature is focused mainly on the UK and countries that followed GAAP which were similar to those used in UK before IFRS. Analysts pointed out that firms were unable to predict future success of R&D investments and that is the reason why they were in favour of expensing (Entwistle 1999). British accountants expressed the same concerns as analysts about the future uncertain benefits of R&D investments and the level of managerial judgement required to make the decision to capitalize (Stainer and Nixon 1997). Evidence from the US is also supportive that R&D capitalization is not a trustworthy indication of successful or not R&D projects (see: Loudder and Behn (1995); Boone and Raman (2001); Chambers et al. (2003).

From the auditors' point of view, they are concerned about the risks of overcapitalization, and they also expressed concerns about risks involved in R&D. Moreover, auditors must verify management's judgement and sometimes this is achieved by hiring external experts, which further increases the audit fee (Cheng et al. 2016; Kreß et al. 2019). It seems that auditors are also in favor of expensing.

The Greek listed firms is an ideal sample to conduct a capitalization versus expensing analysis, as those firms report under IAS 38, which allows capitalization. The standard, specifically, mentions that development phase costs must be capitalized when:

- *the technical feasibility of completing the intangible asset (so that it will be available for use or sale)*
- *intention to complete and use or sell the asset*
- *ability to use or sell the asset*
- *existence of a market or, if to be used internally, the usefulness of the asset*
- *availability of adequate technical, financial, and other resources to complete the asset*

- *the cost of the asset can be measured reliably*

If any of the recognition criteria are not met then the expenditure must be charged to the income statement as incurred. Note that if the recognition criteria have been met, capitalisation must take place.

2.1 *Hypothesis development*

The stream of literature that supports the immediate R&D expensing argues that capitalization may lead to capitalize R&D projects which do not exhibit many chances of success in the future and that it can be used to manipulate earnings. Moreover, even under IAS 38 requirements, substantial managerial judgement is required to examine if these requirements are met or not (Stainer and Nixon 1997). Apart from that, evidence shows that firms may decrease or increase their R&D expenditure to beat income benchmarks (Mande et al. 2000). Similarly, Cazavan-Jeny and Jeanjean (2006) and Cazavan-Jeny et al. (2011) find that capitalization of R&D is used for earnings management and has no positive effect on future profitability.

On the other hand, those that support capitalization, argue that it consists of a signal about future performance and that it is a way to convey information about successful R&D projects. There are several studies supporting that capitalized R&D are value relevant. Tsoligkas and Tsalavoutas (2011) provide evidence that capitalized R&D have a positive relationship with market value, both before and after the implementation of IAS 38. In the same spirit, Zhao (2002) supports that in both UK and France, capitalized R&D are value relevant with accounting earnings and book value. Evidence from other non-European countries are also supportive on the capitalization of R&D and their value relevance (see: Landry and Callimaci (2003); Ahmed and Falk (2006).

Under IAS 38, the decision to capitalize is mandated by the standard. However, because there is managerial judgement on whether the requirements are met, management has the flexibility to avoid capitalization or overestimate its judgements and thus capitalize R&D. Whatever the accounting treatment of R&D, it affects all the major financial statements, meaning the income statement and the balance sheet along with the relevant ratios. This is a motive for the managers to manipulate earnings or performance ratios (Cazavan-Jeny et al. 2011).

The capitalization of R&D affects profitability ratios, especially ROE. Firms that capitalize will amortize R&D costs every year until the end of the useful life of the R&D asset (and they do not expense all of them as incurred if they choose

to expense). This leads to a smoother ROE (Healy et al. 2002). Lev et al. (2005) highlighted that if we compare one capitalizer and one expenser after the end of an R&D project, they will have the same earnings but the capitalizer will have a new R&D asset at its balance sheet, thus lower ROA. In similar vein, we expect expensers to exhibit worse leverage ratios. As they report less assets (and equity), ratios like debt-to-assets, will tend to be larger than those of the capitalizers.

Taking under consideration the effects of capitalization or expensing, theoretically we have a set of determinants that potentially can assess whether managers use the accounting treatment for R&D, in order to manipulate earnings. The main hypothesis we make is that managers will choose to capitalize, when their performance is poor and when they are highly leveraged. Moreover, they will choose capitalization when they want to exhibit smooth earnings.

On the same page, when we examine the effect of capitalization on future performance, we expect the following. If managers indeed meet the requirements of IAS 38 and if they are not overestimating the potential future benefits of their R&D projects, we expect a positive relationship between capitalization and future performance. Furthermore, the capitalized R&D of the capitalizers should be more value relevant than their expensed R&D. If we fail to find such relationships, that means that managers have wrongfully capitalized R&D costs. This can happen either because they have manipulated earnings or because they have made wrong judgements about the R&D projects they have undertaken.

3 Sample and descriptive statistics

We use a sample of Greek listed firms (active & inactive) which report R&D activity in their financial statements. We examine the period from 2005 to 2020, as in 2005 the IAS 38- Intangible assets was implemented. The initial dataset consists of 180 firms. We exclude firms with no R&D activity, missing data and financial firms, as financials follow different accounting principles. The final sample is 70 R&D firms (650 firm- year observations). We have winsorized the sample at 1% level to avoid issues with possible outliers.

Table 1: Industry classification

Industry	#obs	%	#capitalizers	#expensers
Basic Resources	72	13,9	10	62
Construction & Mats	34	58,8	20	14
Consumer Prod & Svs	4	100	4	0
Drug & Grocery Stores	38	71	27	11
Energy	16	0	0	16
Food, Bev. And Tobacc	85	11.8	10	75
Health Care	51	31.4	16	35
Ind. Goods & Services	120	27	32	88
Media	4	0	0	4
Retailers	16	0	0	16
Technology	116	30.2	35	81
Telecommunications	46	60.9	28	18
Travel & Leisure	16	100	16	0
Utilities	32	0	0	32
Total	650	30.5	198	452

We split the firms in capitalizers and expensers, following the methodology of Cazavan-Jeny et al. (2011). A firm is classified as a capitalizer if it has capitalized R&D costs once during the 2005-2020 period, otherwise, it is classified as an expenser. The fact that firm is labeled as a capitalizer does not indicate that it has not expensed R&D costs at all; the majority of the capitalizers have capitalized and expensed R&D simultaneously. By observing the distribution of capitalizers in the industries, we notice that their proportion differs across industries. In two industries (consumer products, travel and leisure) all firms are classified as capitalizers, where there are industries (energy, media, retailers and utilities) that their

firms have never capitalized any R&D costs.

Table 2 reports the characteristics of capitalizers and expensers. The main differences we notice is that expensers are smaller compared to capitalizers, in terms of average size, and that expensers are slightly but not significantly more profitable. Apart from being less profitable, capitalizers display more volatile profits. In terms of leverage, capitalizers are more leveraged while they exhibit higher capital expenditures. In future performance, there is not significant difference between the two groups, however, expensers again are slightly more profitable. Last but not least, in terms of future sales growth, expensers exhibit higher growth.

Table 2: Sample characteristics

Capitalizers			Expensers	
Statistic	N	Mean	N	Mean
SIZE	198	12.127	452	11.506
ROA	198	0.056	452	0.058
CF_RD	198	0.016	452	0.024
DEBTCAP	198	0.443	452	0.325
CAPEX	198	0.064	452	0.052
CV_ROA	198	2.865	452	1.822
CV_CFRD	198	2.072	452	0.743
S_GROWTH1	181	5.601	412	5.722
S_GROWTH3	148	5.613	335	5.756
RD_CAPXCF_RD	198	0.014	452	0.000
CF_RDEXP_CAP	198	0.011	452	0.024
CF_RDCAP_CAP	198	0.003	452	0.000
PTB	196	1.428	435	1.065
FUTROA1	181	0.053	412	0.055
FUTROA3	148	0.048	335	0.052

4 Main results

In the first stage of our analysis, we examine whether Greek managers use R&D capitalization for earnings management. To do so, we run two determinants test of R&D capitalization. In the second stage, we examine how R&D reporting affects

future firm performance.

4.1 *R&D capitalization determinants tests*

In order to examine whether management uses R&D capitalization to manage earnings, we run two tests. First, we investigate the determinants of a firm in order to be classified as a capitalizer or an expenser. We estimate the following two equations using a Probit regression to explain the decision for a firm to be classified as a capitalizer or an expenser.

$$\begin{aligned} RDCAP_t = \alpha_0 + \alpha_1 SIZE_t + \alpha_2 ROA_t + \alpha_3 CF\_RD_t \\ + \alpha_4 DEBTCAP_t + \alpha_5 CAPEX_t + \alpha_6 CV\_ROA_t \\ + \alpha_7 CV\_CFRD_t + \alpha_{10} \sum INDUSTRY_k + \alpha_{11} \sum YEAR_k + \epsilon_t \end{aligned} \quad (1)$$

$$\begin{aligned} RDCAP_t = \alpha_0 + \alpha_1 SIZE_t + \alpha_2 ROA_t + \alpha_3 CF\_RD_t + \alpha_4 DEBTCAP_t \\ + \alpha_5 CAPEX_t + \alpha_6 CV\_ROA_t + \alpha_7 CV\_CFRD_t + \alpha_8 ZBENCH_t \\ + \alpha_9 LYBENCH_t + \alpha_{10} \sum INDUSTRY_k + \alpha_{11} \sum YEAR_k + \epsilon_t \end{aligned} \quad (2)$$

where $RDCAP_t$ is the decision of the firm to capitalize or not in the subsequent year t. We include industry and time indicator variables, as in each industry the capitalization rate is different.

We notice that capitalizers, in terms of total assets are larger than expensers. Thus capitalizers exhibit a lower ROA. Even though net income may be similar for the two groups, the R&D assets reported by capitalizers, will cause bias in the calculation of ROA (Healy et al. 2002). For this reason, all variables, apart from CF_RD and CV_CFRD, are calculated before R&D activities. We exclude R&D amortization and expensed R&D from the calculation of net income and total assets. In this way, we derive adjusted ROA and SIZE, so differences in R&D reporting do not affect our metrics.

According to White et al. (2002), we expect capitalization to improve profitability and leverage ratios, and smooth earnings. We expect the following signs on the coefficients in the variables of Equation (1) if managers use R&D capitalization to manipulate earnings. We expect a negative coefficient between size and

R&D capitalization, as larger firms typically expense larger proportion of their R&D outlays (Aboody and Lev 1998). Moreover, Aboody and Lev support that profitable companies, avoid capitalization in order not to harm the quality of their earnings. Similarly, Cazavan-Jeny and Jeanjean (2006) have indicated that capitalization of R&D is the preferred accounting choice when performance is poor. Thus, we expect a negative coefficient on ROA.

It is well established in the literature that management prefers smooth earnings (Degeorge et al. 1999). R&D capitalization can be used to achieve this goal, so we expect a negative relationship between capitalization and the volatility variables (CV_CFRD, CV_ROA) (Healy et al. 2002). Finally, we use leverage ($DEBTCAP$) as a proxy for the restrictiveness of loan covenants. Firms may use R&D capitalization to affect their leverage ratio and avoid restrictions imposed from loan covenants (Aboody and Lev 1998).

In Model 2, we introduce two additional variables, $ZBENCH$ and $LYBENCH$, as proxies for the management's incentives to beat performance benchmarks by capitalizing R&D. Burgstahler and Dichev (1997) stated that firms seek to avoid reporting losses or decreases in earnings. Since capitalized R&D do not affect the income statement, we expect management to use capitalization in order to beat income benchmarks. Thus we expect a positive coefficient on these two variables.

Table 3 reports our findings for Eq. (1) and Eq. (2). Model 1 suggests that larger firms, with high R&D intensity which are highly-leveraged, prefer capitalization over expensing. The positive and statistically significant coefficient of $DEBTCAP$, is an indication that management attempts to use capitalization to manipulate their gearing ratio, possibly because they face restrictions from debt covenants. As expected, we see a negative coefficient in ROA, consistent with the hypothesis that management prefers capitalization when performance is poor. Interestingly, we find no evidence that variables related to variation of ROA and CF_RD, affect the decision to capitalize or expense. In Model 2, as per the benchmark beating hypothesis, we find a positive coefficient in $ZBENCH$. This suggests that management uses capitalization to meet the last year's income benchmark, thus, it is a sign of earnings management.

In overall, from the Probit regression, we concur that indeed management uses capitalization to manage earnings in several ways. They use it, so they can mask poor performance, meet income thresholds and manipulate their gearing ratio.

Table 3: Determinants test

	Dependent variable:	
	RDCAP	
	(1)	(2)
SIZE	0.432***	0.455***
	(0.087)	(0.089)
ROA	−2.744**	−4.550***
	(1.389)	(1.736)
CF_RD	17.496***	18.486***
	(3.622)	(3.738)
DEBTCAP	1.411***	1.590***
	(0.498)	(0.517)
CAPEX	6.156***	6.275***
	(2.100)	(2.140)
CV_ROA	−0.085	−0.072
	(0.067)	(0.063)
CV_CFRD	0.187	0.159
	(0.140)	(0.122)
LYBENCH		0.072
		(0.215)
ZBENCH		0.706**
		(0.346)
Constant	−15.084	−15.920
	(344.219)	(324.672)
Observations	650	650
Log Likelihood	−117.474	−115.250
Akaike Inf. Crit.	306.949	306.499
Note:	*p<0.1; **p<0.05; ***p<0.01	

4.2 *Future performance prediction*

In this section we explore whether the accounting treatment of R&D costs is able to predict future performance. We hypothesize that managers follow the rules of IAS 38 in order to capitalize their R&D, and if so, we expect that capitalization is associated with superior future performance because capitalized R&D under IAS 38 are projects which are technically feasible and are expected to bring future commercial success to the firm. On the other hand, if management uses capitalization for earnings management, we expect the opposite. To test our hypothesis we follow Cazavan-Jeny et al. (2011) and we use future performance and sales growth as measures of firm performance. The model is estimated using by a pooled OLS regression.

4.2.1 *Sales growth model*

We use the following equation to model sales growth:

$$\begin{aligned} S\_GROWTH_k = \alpha_0 + \alpha_1 CF\_RDEXP_t + \alpha_2 CF\_RDEXP\_CAP_t + \\ + \alpha_3 CF\_RDCAP\_CAP_t + \alpha_4 S\_GROWTH_t + \alpha_5 PTB_t + \alpha_6 SIZE_t + \\ \alpha_7 CAPEX_t + \alpha_8 \sum INDUSTRY_k + \alpha_9 \sum YEAR_k + \epsilon_t \quad (3) \end{aligned}$$

where S_GROWTH is the natural logarithm for sales in year t+k/sales in year t, $k = 1$ or $k = 3$; all other variables are defined in Appendix A. Industry and time indicator variables have been included. We use a three year horizon at our predictions because three years are required on average for an R&D asset to be amortized.We include industry and time indicator variables, as in each industry the capitalization rate is different. Standard errors are robust to firm clustering.

We follow Cazavan-Jeny et al. (2011) and we include $SIZE$ and $CAPEX$ as control variables. Larger firms tend to face difficulties in achieving sales growth. Larger capital expenditure is associated with larger sales growth. We expect a positive association between PTB and sales growth, as according to Chan et al. (2003), high growth is associated with firms that exhibit low book-to-market ratios. We want to examine whether the decision to capitalize is a signal for future superior performance. Therefore, we split CF_RD in three new components, CF_RDEXP (R&D cash flow of expensers), CF_RDEXP_CAP (expensed R&D cash flow of capitalizers) and CF_RDCAP_CAP (capitalized R&D cash

flow of capitalizers). If the signaling hypothesis stands, we expect positive coefficients in the R&D capitalization proxies.

Columns (1) and (2) in Table 4 are the estimated sales growth models for the two forecast horizons. We cannot find evidence that capitalization of R&D is related with future sales growth, as coefficients in the relative variables are not statistically significant in both forecasting horizons. Thus, there is no difference in terms of sales growth between capitalizers and expensers. IAS 38 requires that capitalized R&D are associated with projects that are likely to exhibit future commercial success. Our results cannot support this hypothesis and are consistent with managers either using capitalization for earnings management or they are overconfident regarding their estimations for future sales.

4.2.2 *Future income model*

As Cazavan-Jeny et al. (2011),we use an income model to further explore how capitalization affects future performance. The model is estimated using by a pooled OLS regression. The model has the following specification:

$$\begin{aligned} FUTROA_k = \alpha_0 + \alpha_1 CF\_RDEXP_t + \alpha_2 CF\_RDEXP\_CAP_t + \\ + \alpha_3 CF\_RDCAP\_CAP_t + \alpha_4 ROA_t + \alpha_5 PTB_t + \alpha_6 SIZE_t + \\ \alpha_7 CAPEX_t + \alpha_8 \sum INDUSTRY_k + \alpha_9 \sum YEAR_k + \epsilon_t \quad (4) \end{aligned}$$

where $FUTROA_k$ is measured as $\sum ROA_{t,t+k}/(k+1)$, $k = 1$ or $k = 3$. All other variables are defined in Appendix A. We include industry and time indicator variables, as in each industry the capitalization rate is different. Standard errors are robust to firm clustering

The regression results are reported in Table 4, in Columns (3) and (4). In this model, the expensed R&D of the expensers have a significant and negative relationship with future income over both forecasting horizons, as it is expected from the theoritical hypothesis. Interestingly, the expensed R&D of capitalizers exhibit a positive and significant relationship with future income, over both forecasting horizons. On the other hand, the capitalized R&D of the capitalizers, do not exhibit a positive and significant relationship with future income. The absence of statistical significance, is an indication of earnings management. These results are quite similar with those of Cazavan-Jeny et al. (2011) and Cazavan-Jeny and Jeanjean (2006). Our findings are in line with the hypothesis that managers use

capitalization of R&D for earnings management or they overestimate the future performance of their capitalized projects.

Table 4: Performance forecast

	Dependent variable:			
	SGR1	SGR3	FUTROA1	FUTROA3
	(1)	(2)	(3)	(4)
CF_RDEXP	−0.043	−0.722	−1.645***	−2.956**
	(0.034)	(0.511)	(0.620)	(1.465)
CF_RDEXP_CAP	−0.023	0.652	1.866***	3.332**
	(0.041)	(0.492)	(0.613)	(1.483)
CF_RDCAP_CAP	0.115	0.802	1.338*	2.265
	(0.117)	(0.554)	(0.712)	(1.519)
log10(NETSAL)	0.095***	0.091***		
	(0.004)	(0.005)		
ROA			0.796***	0.556***
			(0.021)	(0.049)
PTB	−0.001	−0.001	0.002	0.003
	(0.001)	(0.001)	(0.002)	(0.003)
SIZE	−0.003*	−0.0002	0.0004	−0.002
	(0.002)	(0.002)	(0.001)	(0.003)
CAPEX	0.006	0.010	−0.047*	−0.044
	(0.007)	(0.011)	(0.028)	(0.060)
Constant	0.255***	0.256***	−0.021	0.003
	(0.009)	(0.010)	(0.015)	(0.035)
Observations	540	433	540	433
Adj. R-Squared	0.87	0.89	0.88	0.68
Note:				*p<0.1; **p<0.05; ***p<0.01

4.3 *The self-selection bias issue*

A well known issue in social science research is the sample selection bias. The issue of selection bias occurs when a non-randomly selected sample is used. In economics, the issue and possible solutions have been heavily researched by James Heckman. Self-selection is a reason that leads to selection bias. Self-selection occurs by sample decisions made by the analysts or by the decisions made by the individuals that are being studied (Heckman 1979).

In the accounting treatment of R&D literature, this issue is not widely recognized. However, both Aboody and Lev (1998) and Cazavan-Jeny and Jeanjean (2006) tried an approach to treat self-selection. At a first glance, under IAS 38, a firm does not have a choice on when to capitalize R&D costs; if the requirements of the standard are met, then capitalization is obligatory. However, if the requirements are met or not, meaning if the R&D project is going to be economically successful or not in the future, it is a judgement made by the management. That means, that management may have motives not to capitalize R&D, such as earnings management, and choose not to capitalize. In other words, future performance of firms may be affected by other firm characteristics, where capitalizers and expensers differ, rather than the R&D accounting treatment per se.

To address the issue we follow a similar approach to Cazavan-Jeny and Jeanjean (2006). We extract the fitted values of $RDCAP$ (the capitalization variable) from the determinants model, and we add the fitted values ($fitRDCAP$) as an additional independent variable in our future performance models. We report our results in Table 5. For each model we have estimated, we compare it with the corresponding one which includes the $fitRDCAP$. E.g, for the two sales growth models in Columns (1) and (2) we make a comparison with Columns (3) and (4), which are the same models augmented with $fitRDCAP$.

In the sales growth model, we notice that the decision to capitalize has a significant and negative relationship with future sales growth. This means that ceteris paribus, the decision to capitalize is associated with lower sales growth in the future. The capitalized proportion of R&D outlays of the capitalizers became significant and are associated positively with sales growth only in the short-term horizon. This denotes that maybe self-selection has driven our results in the initial model. In all other variables we notice no difference in statistical importance or coefficients, apart from $CAPEX$, which became significant in the short-term sales growth model. Interestingly, in both future income models, $fitRDCAP$ is not significant and all other variables are the same at both significance and coefficients, so we cannot state that there is self-selection in this model.

	Dependent variable:							
	SGR1	SGR1B	SGR3	SGR3B	FUTROA1	FUTROA1B	FUTROA3	FUTROA3B
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
fitRDCAP			−0.021***	−0.018***			−0.009	0.007
			(0.004)	(0.005)			(0.013)	(0.019)
CF_RDEXP	−0.043	−0.722	−0.038	−0.677	−1.645***	−2.956**	−1.640***	−2.984**
	(0.034)	(0.511)	(0.034)	(0.444)	(0.620)	(1.465)	(0.617)	(1.483)
CF_RDEXP_CAP	−0.023	0.652	−0.006	0.628	1.866***	3.332**	1.874***	3.349**
	(0.041)	(0.492)	(0.040)	(0.428)	(0.613)	(1.483)	(0.613)	(1.501)
CF_RDCAP_CAP	0.115	0.802	0.382**	0.996*	1.338*	2.265	1.457*	2.195
	(0.117)	(0.554)	(0.156)	(0.530)	(0.712)	(1.519)	(0.765)	(1.547)
log10(NETSAL)	0.095***	0.091***	0.096***	0.091***				
	(0.004)	(0.005)	(0.004)	(0.005)				
ROA					0.796***	0.556***	0.792***	0.559***
					(0.021)	(0.049)	(0.021)	(0.048)
PTB	−0.001	−0.001	−0.001*	−0.001*	0.002	0.003	0.002	0.003
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.003)	(0.002)	(0.003)
SIZE	−0.003*	−0.0002	−0.002	0.001	0.0004	−0.002	0.001	−0.003
	(0.002)	(0.002)	(0.001)	(0.002)	(0.001)	(0.003)	(0.002)	(0.003)
CAPEX	0.006	0.010	0.015**	0.018	−0.047*	−0.044	−0.042	−0.048
	(0.007)	(0.011)	(0.007)	(0.011)	(0.028)	(0.060)	(0.030)	(0.061)
Constant	0.255***	0.256***	0.238***	0.240***	−0.021	0.003	−0.029	0.009
	(0.009)	(0.010)	(0.010)	(0.011)	(0.015)	(0.035)	(0.022)	(0.042)

Note: *p<0.1; **p<0.05; ***p<0.01

Table 5: Regressions with self-selection controls

5 Conclusion

In this research we examine a sample of Greek listed firms which report R&D activity in their financial statements. We seek to answer two main research questions. Which are the criteria that make management capitalize R&D costs and whether this reporting choice is a credible signal about the future performance of the firm. In Greece, since 2005, IFRS are used for reporting financial statements, so capitalization of R&D is imposed if the requirements set by IAS 38 are met. R&D projects must be capitalized if management is able to prove that these projects are likely to succeed and bring future economic benefits to the firm.

First we examine the determinants of R&D capitalization to find out what makes firms to capitalize R&D and second, we estimated two future performance models. The R&D capitalization determinants tests revealed that capitalizing firms are larger, more leveraged and less profitable than expensing firms. Furthermore, we find that firms capitalize when they have a benchmark to beat, in our case the last year's income. This is consistent with the theory that capitalization is used to beat thresholds (Dinh et al. 2016).

In the second part of our empirical research, examining the relationship of capitalization with future performance, we hypothesize that because firms capitalize R&D under IAS 38, they have demonstrated that the capitalized R&D project will bring future economic benefits to the firm. Thus we expect to find a positive relationship between capitalized R&D and future performance (and a negative with expensed R&D). However, we cannot support this hypothesis, as our results indicate that the decision to capitalize versus expense has a negative or at the best, no effect at all at future firm performance. Moreover, we have evidence that when capitalizers expense a part of their R&D costs, only the expensed proportion of R&D is associated with better future performance and not the capitalized one.

These findings are opposing the past R&D literature (see: Lev and Sougiannis (1996); Healy et al. (2002); Oswald and Zarowin (2007)) but are in line with a stream of literature that questions the use of R&D capitalization as a signal for future performance (see:Cazavan-Jeny and Jeanjean (2006); Markarian et al. (2008); Cazavan-Jeny et al. (2011). We have to notice though, that in the best of our knowledge, this is the first study of the R&D capitalization and future performance relationship in the Greek setting, so we do not still have similar studies to compare our results with. In conclusion, our results indicate that the scope of IAS 38, at least in the Greek setting, fails. Although we have indications of earnings management attempts by the firms there are maybe more reasons for this failure. It is possible that management either overestimates the future success of

R&D projects or they just fail to engage in successful R&D projects. Maybe there is a general issue about Greek firms failing to truly innovate and provide novel products or services that will bring them future economic benefits and make them distinguish from their competitors abroad.

Our results contribute to the literature in several ways. This study is one of the first attempting to shed light in the R&D accounting treatment and its implications in Greece. Apart from that, we join a stream of literature about the continuous debate of the capitalization versus expensing of R&D. Most of the studies have examined the issue before the IFRS adoption, and by examining a period and a country that IFRS is mandatory, we make a contribution to the literature. Our results can also be expanded to the debate about R&D treatment by IFRS versus US GAAP, and whether managers should be given the flexibility to choose their accounting policies or follow strict rules (principles versus rules accounting).

One limitation of our study is that we were not able to obtain enough adequate R&D data prior to 2005 and make a comparison of R&D capitalization prior and after the implementation of IAS 38. For future research, we suggest the exploration of the field by using machine learning algorithms and out-of-sample predictions of R&D choice and future profitability.

Acknowledgement

The research work was supported by the Hellenic Foundation for Research and Innovation (HFRI) under the 4th Call for HFRI PhD Fellowships (Fellowship Number: 009116).

Appendix A: Variable definitions

Table 6: Variable definitions

Variable	Measurement
RDCAP	1 if change in gross development costs is positive, 0 otherwise
TAFR	Total assets-gross development costs+development costs amortization
RDS	Expensed R&D/sales
CF_RD	(RDS*sales*+DGross development costs)/AvgTAFR
CV_CFRD	SD(CF_RD)/—Avg.CF_RD—
CF_RDEXP	CF_RD if the firm expenses R&D
CF_RDEXP_CAP	RDS*sales/Avg.TAFR
CF_RDCAP_CAP	(DGross development costs)/Avg.TAFR
SIZE	Ln(TAFR)
ROA	(Income before extraordinary items, taxes and dividents+net financial expenditure+amortized R&D+expensed R&D)/Avg.TAFR
CV_ROA	SD(ROA)/—Avg.ROA—
PTB	
CAPEX	CAPEX/Avg.TAFR
DEBTCAP	Total debt/Avg.TAFR
ZBENCH	1 if income before R&D, extraordinary items and taxes is lower than R&D outlays, 0 otherwise
LYBENCH	1 if CF_RD>DROA, 0 otherwise

Appendix B: Descriptive statistics

Table 7: Descriptive statistics

Statistic	N	Mean	St. Dev.	Min	Max
SIZE	650	11.695	1.722	7.507	15.925
ROA	650	0.058	0.102	−0.266	0.399
CF_RD	650	0.021	0.043	−0.0002	0.232
DEBTCAP	650	0.361	0.254	0.000	1.354
CAPEX	650	0.056	0.056	0.0003	0.284
CV_ROA	650	2.140	3.607	0.160	24.541
CV_CFRD	650	1.148	1.966	0.221	13.557
S_GROWTH1	593	4.866	0.774	2.713	7.054
S_GROWTH3	483	4.880	0.778	2.757	7.070
RD_CAPXCF_RD	650	0.004	0.011	−0.0002	0.063
CF_RDEXP_CAP	650	0.020	0.041	0.000	0.226
CF_RDCAP_CAP	650	0.001	0.005	−0.001	0.038
PTB	631	1.178	1.338	−1.763	7.124
FUTROA1	593	0.055	0.091	−0.182	0.355
FUTROA3	483	0.051	0.079	−0.139	0.314

References

Aboody, D. and Lev, B. (1998). The value relevance of intangibles: The case of software capitalization. *Journal of Accounting Research*, 36:161–191.

Ahmed, K. and Falk, H. (2006). The value relevance of management's research and development reporting choice: Evidence from australia. *Journal of Accounting and Public Policy*, 25(3):231–264.

Al-Horani, A., Pope, P. F., and Stark, A. W. (2003). Research and Development Activity and Expected Returns in the United Kingdom. *Review of Finance*, 7(1):27–46.

Boone, J. P. and Raman, K. (2001). Off-balance sheet R&D assets and market liquidity. *Journal of Accounting and Public Policy*, 20(2):97–128.

Burgstahler, D. C. and Dichev, I. D. (1997). Earnings, adaptation and equity value. *The Accounting Review*, 72(2):187–215.

Cazavan-Jeny, A. and Jeanjean, T. (2006). The negative impact of R&D capitalization: A value relevance approach. *European Accounting Review*, 15(1):37–61.

Cazavan-Jeny, A., Jeanjean, T., and Joos, P. (2011). Accounting choice and future performance: The case of R&D accounting in France. *Journal of accounting and public policy*, 30(2):145–165.

Chambers, D., Jennings, R., and Thompson, R. B. (2003). Managerial discretion and accounting for research and development costs. *Journal of Accounting, Auditing & Finance*, 18(1):79–114.

Chan, L. K. C., Karceski, J., and Lakonishok, J. (2003). The level and persistence of growth rates. *The Journal of Finance*, 58(2):643–684.

Cheng, J.-C., Lu, C.-C., and Kuo, N.-T. (2016). R&D capitalization and audit fees: Evidence from China. *Advances in Accounting*, 35:39–48.

Degeorge, F., Patel, J., and Zeckhauser, R. (1999). Earnings management to exceed thresholds. *The Journal of Business*, 72(1):1–33.

Dinh, T., Kang, H., and Schultze, W. (2016). Capitalizing Research & Development: Signaling or Earnings Management? *European Accounting Review*, 25(2):373–401.

Entwistle, G. M. (1999). Exploring the R&D Disclosure Environment. *Accounting Horizons*, 13(4):323–342.

Healy, P. M., Myers, S. C., and Howe, C. D. (2002). R&D Accounting and the Tradeoff Between Relevance and Objectivity. *Journal of Accounting Research*, 40(3):677–710.

Heckman, J. J. (1979). Sample selection bias as a specification error. *Econometrica*, 47(1):153–161.

Kreß, A., Eierle, B., and Tsalavoutas, I. (2019). Development costs capitalization and debt financing. *Journal of Business Finance & Accounting*, 46(5-6):636–685.

Landry, S. and Callimaci, A. (2003). The effect of management incentives and cross-listing status on the accounting treatment of R&D spending. *Journal of International Accounting, Auditing and Taxation*, 12(2):131–152.

Lev, B. and Gu, F. (2016). *The end of accounting and the path forward for investors and managers*. John Wiley & Sons.

Lev, B., Sarath, B., and Sougiannis, T. (2005). R&D reporting biases and their consequences. *Contemporary Accounting Research*, 22(4):977–1026.

Lev, B. and Sougiannis, T. (1996). The capitalization, amortization, and value-relevance of R&D. *Journal of Accounting and Economics*, 21(1):107–138.

Lev, B. and Zarowin, P. (1999). The boundaries of financial reporting and how to extend them. *Journal of Accounting Research*, 37(2):353–385.

Loudder, M. L. and Behn, B. K. (1995). Alternative Income Determination Rules and Earnings Usefulness: The Case of R&D Costs. *Contemporary Accounting Research*, 12(1):185–205.

Mande, V., File, R. G., and Kwak, W. (2000). Income Smoothing and Discretionary R&D Expenditures of Japanese Firms. *Contemporary Accounting Research*, 17(2):263–302.

Markarian, G., Pozza, L., and Prencipe, A. (2008). Capitalization of R&D costs and earnings management: Evidence from Italian listed companies. *The International Journal of Accounting*, 43(3):246–267.

Oswald, D. R. and Zarowin, P. (2007). Capitalization of R&D and the Informativeness of Stock Prices. *European Accounting Review*, 16(4):703–726.

Prencipe, A., Markarian, G., and Pozza, L. (2008). Earnings management in family firms: Evidence from R&D cost capitalization in Italy. *Family Business Review*, 21(1):71–88.

Ronen, J. (2001). On R&D capitalization and value relevance: a commentary. *Journal of Accounting and Public Policy*, 20(3):241–254.

Shehata, M. (1991). Self-selection bias and the economic consequences of accounting regulation: An application of two-stage switching regression to sfas no. 2. *The Accounting Review*, 66(4):768–787.

Stainer, A. and Nixon, B. (1997). Productivity and performance measurement in R&D. *International Journal of Technology Management*, 13(5-6):486–496.

Tsoligkas, F. and Tsalavoutas, I. (2011). Value relevance of R&D in the UK after IFRS mandatory implementation. *Applied Financial Economics*, 21(13):957–967.

White, G. I., Sondhi, A. C., and Fried, D. (2002). *The analysis and use of financial statements*. John Wiley & Sons.

Zhao, R. (2002). Relative Value Relevance of R&D Reporting: An International Comparison. *Journal of International Financial Management & Accounting*, 13(2):153–174.

Zéghal, D. and Maaloul, A. (2011). The accounting treatment of intangibles – a critical review of the literature. *Accounting Forum*, 35(4):262–274.

LSE

THE LONDON SCHOOL OF ECONOMIC AND POLITICAL SCIENCE

10th Biennial PhD Contemporary Greece & Cyprus

HELLENIC OBSERVATORY

26 May 2023

The Development of a Functional Model of Knowledge Management in the Public Sector in Greece

Fotios Zygouris

PhD University of Macedonia Thessaloniki Greece

KNOWLEDGE

* In the dynamic environment of recent years, knowledge is evolving as a sustainable characteristic of organizations and at the same time, research in this field is growing rapidly (Ragab and Arisha , 2013)
* Today's economy is based on knowledge. Knowledge is widely regarded as the most important organizational resource for the long-term competitive advantage and success of any organization (Nonaka and Takeuchi , 1995).

Knowledge management in the public sector

* Knowledge management is a systematic process which is the result of the coordination and combination of organizational practices
* These organizational practices are related to the building, acquisition, storage, sharing, development, publication and application of knowledge by people and groups regarding the main goals of organizations (Rastogi, 2000)
* Knowledge management has added value in the public sector(Zygouris and Papadopoulou, 2022)
*

The relationship of organizational innovation with knowledge management

* The correct implementation of knowledge management practices contributes to greater efficiency, the development of innovation, the reduction of case processing time and the achievement of the long-term goals of public sector organizations (Colnar and Dimovski , 2017)
* An important element is the development of a mindset in the work environment which enhances innovation. If employees do not understand the need for improvement and innovation, they will not spend time creating and sharing knowledge (Talisayon , 2003)
*

The relationship of organizational behavior with knowledge management

* Organizational behavior investigates the impact that individuals, groups and structures have on behavior within the organization
* The main purpose is to apply this knowledge in order to improve the effectiveness of the organization
* At the same time, organizational behavior examines the behaviors of individuals in the organization and how these behaviors affect the organization's performance (Robbins and Judge , 2010)

Learning Organization - Learning Organization

* The process of learning in an organization is very important. The organization through the training of its competent employees has the possibility of realizing its goals
* Also, training develops the knowledge and skills of human resources and covers the needs of the organization in a constantly changing environment (Asderaki , and Samul , 2015)
* According to learning organizations are spaces in which people continuously expand their capacity in order to create desired outcomes. Also, to cultivate new patterns of thinking and for people to learn on an ongoing basis how they learn together (Senge,1993)

Purpose and objectives of the research

* The main objective of the research is to highlight and investigate the particularity of knowledge management in the Greek public sector
* Also, to capture the preferences of civil servants regarding knowledge management practices such as organizational excellence, organizational culture and behavior, organizational innovation and organizational learning
* The purpose of the thesis is the connection and relationship of knowledge management with determining factors that help the organizational development of public services
* To approach the research problem, three research questions were formulated as well as the design and development of empirical research

Population and sample size of the main survey

* The sample size of the present research is 1,023 people. The present research is large in scope and the sample size of 1,023 individuals is capable of showing the important role of knowledge management and its practices in public services
* More specifically, 412 men and 611 women participated from various age groups, levels of education, years of service and from all the geographical divisions of the Greek territory

From the above, we define the following research hypotheses: 1/2

* H_1 : Service Behavior regarding learning has a direct positive effect on Knowledge Management.
* H_2 : Service Learning Behavior has a direct positive effect on Organizational Innovation.
* H_3 : The Behavior of Colleagues towards learning has a direct positive effect on Knowledge Management.
* H_4 : The Behavior of Colleagues towards learning has a direct positive effect on Organizational Innovation.
* H_5 : Personal Behavior towards learning has a direct positive effect on Knowledge Management

From the above, we define the following research hypotheses: 1/2

* H_6 : Personal Behavior towards learning has a direct positive effect on Organizational Innovation.
* H_7 : The Behavior of Colleagues towards learning positively affects the Personal Behavior towards learning.
* H_8 : The Behavior of the Service towards learning positively affects the Behavior of Colleagues towards learning.
* H_9 : Service Behavior towards learning positively affects Personal Behavior.

RESULTS 1/3

* In detail, Organizational Innovation has a direct positive effect on Knowledge Management
* Personal behavior has a positive overall effect on Knowledge Management, so hypothesis $_{H5}$ is partially supported
* Service Behavior has a direct positive effect on Knowledge Management, thus hypothesis H1 is supported
* In addition, the indirect effect is more than double the direct effect with the result
* Service Behavior affects Knowledge Management in many ways and the indirect effects are even greater than the direct effects

RESULTS 2/3

* In addition, Service Behavior has a significant direct positive effect on Organizational and thus supporting hypothesis H_2
* Also, Service Behavior has a direct positive effect on Personal Behavior and a less indirect positive effect while thus supporting hypothesis H_9
* However, Service Behavior only has a significant direct positive effect on Coworker Behavior and thus hypothesis H_8 is supported

RESULTS 3/3

* the Behavior of Colleagues shows a direct positive effect on Knowledge Management partially supporting hypothesis H_3
* Finally, hypothesis H_7 is also supported as the Behavior of Colleagues has only a direct positive effect on Personal behavior

Discussion of the model 1/2

* Personal behavior affects the climate and culture in the workplace as well as relationships between colleagues. When employees operate in a work climate that fosters trust then the effectiveness of the organization increases. A key element is the participation of employees in decision-making and in the formulation of the organization's policies in order to increase the trust of the organization

Discussion of the model 2/2

* Additionally, Service Behavior has a significant direct positive effect on Organizational Innovation and a smaller indirect one
* Research shows that learning in an organization helps human resources to develop effectively
* Service Behavior has a direct positive effect on Personal Behavior less indirect positive effect while the total effect amounts to and thus the hypothesis is supported However, Service Behavior only has a significant direct positive effect on Coworker Behavior

Model conclusions 1/7

* In conclusion, the answers show that Organizational Innovation has a direct positive effect on Knowledge Management
* Personal behavior has a positive overall effect on Knowledge Management. More specifically, when employees feel that they actively participate in the development of goals and the operation of services, then knowledge management is strengthened.
* Personal behavior determines developments in the work environment and enhances the effectiveness of organizations
* When employees are motivated and feel involved in the organization's operations, they increase their efforts and contribute more to the diffusion and sharing of knowledge

Model conclusions 2/7

* Personal behavior affects the climate and culture in the workplace as well as relationships between colleagues. When employees operate in a work climate that fosters trust then the effectiveness of the organization increases
* At the same time, when they cooperate with each other and exchange experiences, ideas and know-how, they strengthen the continuous improvement of organizations and the production of new knowledge

Model conclusions 3/7

* Service Behavior has a direct positive effect on Knowledge Management Service Behavior affects Knowledge Management in many ways and the indirect effects are even greater than the direct effects
* More specifically, the way the service works affects knowledge management. When the service provides opportunities and motivates them to share knowledge with the rest of the team then creative knowledge management develops

Model conclusions 4/7

* At the same time, there is a direct relationship with the culture that develops in the service
* When this culture is oriented towards the dissemination of professional knowledge to all employees, then the processes of collecting, organizing and disseminating knowledge are improved
* In this way, innovative ideas are developed, new knowledge is created and organizations' goals are achieved more effectively

Model conclusions 5/7

* Service Behavior has a significant direct positive effect on Organizational Innovation and a smaller indirect one. More specifically, it has a positive effect on the development of innovative methods and procedures as well as new practices
* In this way the employees are facilitated by their service in sharing knowledge
* At the same time, the behavior of the service enhances the utilization and motivation of human resources in the sharing of thoughts, ideas and knowledge in order to develop knowledge management and improve the organization and operation of organizations

Model conclusions 6/7

* Service Behavior has a direct positive effect on Personal Behavior less indirect positive effect and thus the hypothesis is supported However, Service Behavior only has a significant direct positive effect on Coworker Behavior and thus the hypothesis is supported
* Coworker Behavior shows a direct positive effect on Knowledge Management and an indirect effect and the hypothesis is partially supported

Model conclusions 7/7

* Finally, the hypothesis is also supported as Coworker Behavior has only a direct positive effect on Personal Behavior
* The results of the quantitative approach are also reinforced by the answers to the qualitative approach
* More specifically, when employees feel active and useful in the service then it has a positive effect on personal behavior
* When the service respects, values, utilizes and rewards the employees then they in turn operate more efficiently in the workplace