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A New Metric for Measuring Near Real-Time Online Media Coverage

Doctoral Thesis

Communication Sciences

Uriel Cruz Silva Ferreira de Oliveira

Supervisors:

Prof. Dr. Miguel R. Trigo

Prof. Dr. Christophe Soares

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Thesis presented to Fernando Pessoa University as part of the requirements for obtaining the degree of Doctor in Communication Sciences, under the supervision of Prof. Dr. Miguel R. Trigo and co-supervision of Prof. Dr. Christophe Soares

To my family, whose unwavering love and
support is the driving force and inspiration
behind everything I do

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Abstract

Although communications professionals widely acknowledge the importance of measuring media coverage, achieving comprehensive and effective measurement remains a significant challenge. Despite some progress by researchers in developing sustainable metrics, many industries continue to rely on simplistic vanity metrics to assess their media presence. This thesis explores the development and application of the Media Output Score (MOS), a novel and integrative metric designed to measure digital media coverage comprehensively. The research addresses the gap in standardized, reliable metrics for evaluating the performance of brands in the media landscape, with a specific focus on near real-time, automated measurement. The MOS integrates both quantitative and qualitative dimensions, distinguishing itself from traditional metrics such as Advertising Value Equivalency (AVE) by focusing not only on the volume of coverage but also on its quality and impact. This provides a more robust and meaningful assessment of media coverage, offering actionable insights for communication professionals. The foundation of the MOS lies in an extensive literature review of recent investigations into media reputation, including key works that emphasize the importance of media coverage in shaping public perception of brands. Grounded in theories such as agenda-setting and media effects, the research draws on established studies by Deephouse (2000), Macnamara (2017), and other scholars, who have highlighted the limitations of outdated metrics and the need for a more holistic approach. This review provided the theoretical basis for the development of MOS, integrating the latest scientific insights into media measurement and its impact on corporate reputation. Methodologically, this study employed the Design Science Research (DSR) approach to develop and validate the MOS algorithm. This approach was selected due to its focus on creating practical solutions to real-world problems, allowing for the iterative design and testing of the MOS as a prototype for measuring digital media coverage. The DSR framework enabled the development of an artifact that integrates various media performance indicators, combining quantitative and qualitative measures into a single, actionable metric that aligns with both theoretical foundations and practical needs in public relations. Through a case study focusing on the Portuguese telecommunications sector (Altice/Meo, NOS, Vodafone) from 2021 to 2023, the MOS was applied to assess media performance across

various outlets. The study demonstrates the metric's ability to reflect shifts in media visibility and favorability, particularly during periods of crisis or recovery. These variations underscore the MOS's dynamic capacity to reflect changes in media sentiment and visibility. Additionally, a 2023 study in the food retail sector (including major brands such as Auchan, Continente, Lidl, Mercadona, and Pingo Doce) further demonstrated the MOS's flexibility. The MOS successfully captured the media performance of these diverse brands, demonstrating its potential applicability across different sectors and suggesting its adaptability as a versatile tool for media coverage measurement. The results confirm the reliability of the MOS in offering valuable insights into how brands are perceived in the media, enabling organizations to benchmark their performance and strategize future media engagements. Furthermore, the study highlights a partial but meaningful correlation between MOS and corporate reputation, suggesting that, while media coverage impacts reputation, other factors—such as customer experience and internal management—play equally significant roles. While this research offers a significant contribution to media measurement, it also acknowledges limitations and opens up challenges for future investigations. The applicability of the MOS across different industries and geographies, as well as the integration of more advanced sentiment analysis and outcome-level metrics, remains a crucial area for further exploration. Further studies could refine the MOS by testing it across more diverse contexts, and integrating it with broader metrics to provide a more comprehensive evaluation of media coverage and corporate reputation. This research contributes to both academic literature and practical applications in public relations, providing a new tool for media evaluation that aligns with modern communication objectives. MOS offers a significant advantage by providing near real-time feedback on media coverage, which is invaluable for communication professionals who need to react and adjust strategies swiftly. The findings advocate for the integration of MOS into strategic decision-making processes, thereby enhancing media reputation management and improving the effectiveness of public relations efforts.

Keywords: Media coverage, media reputation, media measurement, media intelligence, PR measurement, PR output performance

Resumen

Aunque los profesionales de la comunicación reconocen ampliamente la importancia de medir la cobertura mediática, lograr una medición integral y efectiva es un desafío significativo. A pesar de ciertos avances de los investigadores en el desarrollo de métricas sostenibles, muchas industrias continúan dependiendo de métricas superficiales para evaluar su presencia en los medios. Esta tesis explora el desarrollo y la aplicación del Media Output Score (MOS), una métrica novedosa e integradora diseñada para medir la cobertura de los medios digitales. La investigación aborda la falta de métricas estandarizadas y confiables para evaluar el rendimiento de las marcas en el panorama mediático, con un enfoque específico en la medición automatizada y casi en tiempo real. El MOS integra tanto dimensiones cuantitativas como cualitativas, diferenciándose de métricas tradicionales como la Equivalencia del Valor Publicitario (AVE) al enfocarse no solo en el volumen de cobertura, sino también en su calidad e impacto. Esto proporciona una evaluación sólida de la cobertura mediática, ofreciendo a los profesionales de la comunicación información procesable. La base del MOS radica en una extensa revisión de la literatura sobre investigaciones recientes en reputación mediática, incluyendo trabajos que enfatizan la importancia de la cobertura mediática en la formación de la percepción pública de las marcas. Basada en teorías como la *agenda-setting* y los efectos de los medios, la investigación se apoya en estudios establecidos por autores como Deephouse (2000), Macnamara (2017), entre otros, que han destacado las limitaciones de métricas obsoletas y la necesidad de un enfoque más holístico. Esta revisión proporcionó la base teórica para el desarrollo del MOS, integrando los últimos conocimientos científicos sobre medición de medios y su impacto en la reputación corporativa. Metodológicamente, este estudio empleó el enfoque de Investigación Basada *Design Science Research (DSR)* para desarrollar y validar el algoritmo del MOS. Este enfoque fue seleccionado por su énfasis en crear soluciones prácticas a problemas del mundo real, permitiendo el diseño y la prueba iterativa del MOS como un prototipo para medir la cobertura mediática. El artefacto integra varios indicadores de rendimiento mediático, combinando medidas cuantitativas y cualitativas en una única métrica procesable que se alinea tanto con los fundamentos teóricos como con las necesidades prácticas en relaciones públicas. A través de un estudio de caso centrado en el sector de

telecomunicaciones portugués de 2021 a 2023, el MOS se aplicó para evaluar el rendimiento mediático en diversos medios. El estudio demuestra la capacidad de la métrica para reflejar cambios en la visibilidad y favorabilidad mediática, particularmente durante períodos de crisis o recuperación. Estas variaciones subrayan la capacidad dinámica del MOS para reflejar cambios en el sentimiento y la visibilidad mediática. Además, un estudio de 2023 en el sector minorista de alimentos demostró aún más la flexibilidad del MOS. El MOS capturó con éxito el rendimiento mediático de estas diversas marcas, demostrando su aplicabilidad potencial en diferentes sectores y sugiriendo su adaptabilidad como una herramienta versátil para la medición de la cobertura mediática. Los resultados confirman la fiabilidad del MOS al ofrecer información valiosa sobre cómo las marcas son percibidas en los medios, permitiendo a las organizaciones comparar su rendimiento y planificar futuras interacciones mediáticas. Además, el estudio destaca una correlación parcial pero significativa entre el MOS y la reputación corporativa, sugiriendo que, aunque la cobertura mediática influye en la reputación, otros factores—como la experiencia del cliente y la gestión interna—juegan roles igualmente importantes. Si bien esta investigación ofrece una contribución significativa a la medición de medios, también reconoce limitaciones y plantea desafíos para futuras investigaciones. La aplicabilidad del MOS en diferentes industrias y geografías sigue siendo un área crucial para explorar. Estudios adicionales podrían refinar el MOS probándolo en contextos más diversos e integrándose con métricas más amplias para proporcionar una evaluación más completa de la cobertura mediática y la reputación corporativa. Esta investigación contribuye tanto a la literatura académica como a las aplicaciones prácticas en relaciones públicas, proporcionando una nueva herramienta para la evaluación mediática que se alinea con los objetivos de comunicación modernos. El MOS ofrece una ventaja significativa al proporcionar retroalimentación casi en tiempo real sobre la cobertura mediática, lo cual es invaluable para los profesionales de la comunicación que necesitan reaccionar y ajustar estrategias con rapidez. Los hallazgos abogan por la integración del MOS en los procesos de toma de decisiones estratégicas, mejorando así la gestión de la reputación mediática y aumentando la efectividad de los esfuerzos de relaciones públicas.

Palabras clave: cobertura mediática, reputación mediática, medición de medios, medición de relaciones públicas

Resumo

Embora os profissionais de comunicação reconheçam a importância de medir a cobertura mediática, alcançar uma medição abrangente e eficaz continua a ser um desafio significativo. Apesar de alguns progressos dos investigadores no desenvolvimento de métricas sustentáveis, muitas indústrias continuam a depender de métricas superficiais para avaliar a sua presença nos meios de comunicação. Esta tese explora o desenvolvimento e a aplicação do Media Output Score (MOS), uma métrica inovadora e integradora projetada para medir de forma abrangente a cobertura dos meios digitais. A investigação aborda a lacuna de métricas padronizadas e fiáveis para avaliar o desempenho das marcas no panorama mediático, com um foco específico na medição automatizada e quase em tempo real. O MOS integra tanto dimensões quantitativas como qualitativas, distinguindo-se de métricas tradicionais como a Equivalência de Valor Publicitário (AVE), ao focar-se não apenas no volume de cobertura, mas também na sua qualidade e impacto. Isto proporciona uma avaliação mais robusta e significativa da cobertura mediática, oferecendo aos profissionais de comunicação informações acionáveis. A base do MOS assenta numa extensa revisão da literatura sobre investigações recentes em reputação mediática, incluindo trabalhos-chave que sublinham a importância da cobertura mediática na formação da perceção pública das marcas. Baseada em teorias como a de agenda-setting e os efeitos dos media, a investigação apoia-se em estudos estabelecidos por autores como Deephouse (2000), Macnamara (2017), entre outros, que destacaram as limitações das métricas obsoletas e a necessidade de uma abordagem mais holística. Esta revisão forneceu a base teórica para o desenvolvimento do MOS, integrando os mais recentes conhecimentos científicos sobre medição de meios e o seu impacto na reputação corporativa. Metodologicamente, este estudo utilizou a abordagem de Investigação Baseada em Design (Design Science Research, DSR) para desenvolver e validar o algoritmo do MOS. Esta abordagem foi seleccionada devido ao seu foco em criar soluções práticas para problemas do mundo real, permitindo o design e a testagem iterativa do MOS como um protótipo para medir a cobertura mediática. O artefacto que integra vários indicadores de desempenho mediático, combinando medidas quantitativas e qualitativas numa métrica única e acionável que se alinha tanto com os fundamentos teóricos como com as necessidades

práticas em relações públicas. Através de um estudo de caso centrado no setor das telecomunicações portuguesas de 2021 a 2023, o MOS foi aplicado para avaliar o desempenho mediático em vários meios de comunicação. O estudo demonstra a capacidade da métrica para refletir mudanças na visibilidade e favorabilidade mediática, particularmente durante períodos de crise ou recuperação. Estas variações sublinham a capacidade dinâmica do MOS para refletir mudanças no sentimento e visibilidade mediática. Além disso, um estudo de 2023 no setor do retalho alimentar demonstrou ainda mais a flexibilidade do MOS. O MOS capturou com sucesso o desempenho mediático destas diversas marcas, demonstrando o seu potencial de aplicabilidade em diferentes setores e sugerindo a sua adaptabilidade como uma ferramenta versátil para a medição da cobertura mediática. Os resultados confirmam a fiabilidade do MOS ao oferecer informações valiosas sobre como as marcas são percebidas nos media, permitindo às organizações comparar o seu desempenho e planejar futuras interações mediáticas. Além disso, o estudo destaca uma correlação parcial, mas significativa, entre o MOS e a reputação corporativa, sugerindo que, embora a cobertura mediática tenha impacto na reputação, outros fatores—como a experiência do cliente e a gestão interna—desempenham papéis igualmente importantes. Embora esta investigação ofereça uma contribuição significativa para a medição de meios, também reconhece limitações e apresenta desafios para futuras investigações. A aplicabilidade do MOS em diferentes indústrias e geografias continua a ser uma área crucial para exploração em estudos futuros. Esta investigação contribui tanto para a literatura académica como para as aplicações práticas em relações públicas, proporcionando uma nova ferramenta para a avaliação mediática que se alinha com os objetivos modernos de comunicação. O MOS oferece uma vantagem significativa ao fornecer feedback quase em tempo real sobre a cobertura mediática, o que é inestimável para os profissionais de comunicação que precisam de reagir e ajustar estratégias rapidamente. As conclusões defendem a integração do MOS nos processos de tomada de decisão estratégica, melhorando assim a gestão da reputação mediática e aumentando a eficácia dos esforços de relações públicas.

Palavras-chave: cobertura mediática, reputação mediática, medição de meios, inteligência mediática, medição de relações públicas, desempenho de saída de relações públicas.

Sommaire

Bien que les professionnels de la communication reconnaissent largement l'importance de mesurer la couverture médiatique, parvenir à une mesure exhaustive et efficace reste un défi majeur. Malgré certains progrès des chercheurs dans le développement de mesures durables, de nombreuses industries continuent de se fier à des métriques simplistes pour évaluer leur présence dans les médias. Cette thèse explore le développement et l'application du Media Output Score (MOS), une mesure nouvelle et intégrative conçue pour mesurer de manière exhaustive la couverture des médias numériques. La recherche aborde le manque de métriques normalisées et fiables pour évaluer les performances des marques dans le paysage médiatique, en se concentrant spécifiquement sur une mesure automatisée et en quasi-temps réel. Le MOS intègre à la fois des dimensions quantitatives et qualitatives, se distinguant des mesures traditionnelles telles que la Valeur Équivalente Publicitaire (AVE) en se concentrant non seulement sur le volume de couverture, mais aussi sur sa qualité et son impact. Cela fournit une évaluation plus robuste et significative de la couverture médiatique, offrant des informations exploitables pour les professionnels de la communication. Le fondement du MOS repose sur une revue approfondie de la littérature récente sur la réputation médiatique, incluant des travaux clés qui soulignent l'importance de la couverture médiatique dans la formation de la perception publique des marques. Fondée sur des théories telles que l'*agenda-setting* et les effets des médias, la recherche s'appuie sur des études établies par des auteurs comme Deephouse (2000), Macnamara (2017) et d'autres chercheurs, qui ont mis en évidence les limites des mesures obsolètes et la nécessité d'une approche plus holistique. Cette revue a fourni la base théorique pour le développement du MOS, intégrant les dernières avancées scientifiques sur la mesure des médias et son impact sur la réputation d'entreprise. Méthodologiquement, cette étude a utilisé l'approche de *Design Science Research* (DSR) pour développer et valider l'algorithme du MOS. Cette approche a été choisie pour son accent sur la création de solutions pratiques à des problèmes réels, permettant la conception et les tests itératifs du MOS en tant que prototype pour mesurer la couverture des médias numériques. DSR a permis le développement d'un artefact intégrant divers indicateurs de performance médiatique, combinant des mesures quantitatives et qualitatives en une seule mesure exploitable, alignée à la fois sur les fondements

théoriques et les besoins pratiques des relations publiques. À travers une étude de cas centrée sur le secteur des télécommunications portugais de 2021 à 2023, le MOS a été appliqué pour évaluer les performances médiatiques dans divers médias. L'étude démontre la capacité de cette métrique à refléter les variations de visibilité et de favorabilité médiatiques, en particulier pendant les périodes de crise ou de reprise. Ces variations soulignent la capacité dynamique du MOS à refléter les changements de sentiment et de visibilité médiatiques. En outre, une étude réalisée en 2023 dans le secteur de la grande distribution alimentaire a démontré encore davantage la flexibilité du MOS. Le MOS a capturé avec succès la performance médiatique, démontrant ainsi son applicabilité potentielle dans différents secteurs et suggérant son adaptabilité comme un outil polyvalent pour mesurer la couverture médiatique. Les résultats confirment la fiabilité du MOS en fournissant des informations précieuses sur la façon dont les marques sont perçues dans les médias, permettant aux organisations de comparer leurs performances et de planifier leurs futures actions médiatiques. De plus, l'étude met en évidence une corrélation partielle mais significative entre le MOS et la réputation d'entreprise, suggérant que, bien que la couverture médiatique influence la réputation, d'autres facteurs—tels que l'expérience client et la gestion interne—jouent des rôles tout aussi importants. Bien que cette recherche apporte une contribution significative à la mesure des médias, elle reconnaît également ses limites et ouvre des défis pour des recherches futures. Études supplémentaires pourraient affiner le MOS en le testant dans des contextes plus diversifiés et en l'intégrant à des métriques plus globales pour fournir une évaluation plus complète de la couverture médiatique et de la réputation d'entreprise. Cette recherche contribue à la fois à la littérature académique et aux applications pratiques en relations publiques, en fournissant un nouvel outil pour l'évaluation des médias qui s'aligne sur les objectifs. Le MOS offre un avantage en fournissant un retour d'information quasi en temps réel sur la couverture médiatique, ce qui est inestimable pour les professionnels de la communication qui doivent réagir et ajuster rapidement leurs stratégies. Les résultats plaident en faveur de l'intégration du MOS dans les processus de prise de décision stratégique, améliorant ainsi la gestion de la réputation médiatique et augmentant l'efficacité des efforts de relations publiques.

Mots-clés : couverture médiatique, réputation médiatique, mesure des médias, mesure des relations publiques

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List of abbreviations

Advertising Value Equivalent (AVE)

Click-through rates (CTR)

Corporate Social Responsibility (CSR)

Design Science Research (DSR)

International Association for the Measurement and Evaluation of Communication (AMEC)

Large Language Models (LLMs)

Media Output Score (MOS)

Natural language processing (NLP)

Preparation, Implementation, and Impact model (PII)

Public Relations (PR)

Share of voice (SOV)

Variance Inflation Factor (VIF)

Introduction

1.1 Context and relevance

Scientific research has shown that the media influence public opinion and knowledge, particularly since the agenda-setting theory, which initially proposed that media coverage of certain issues increases their relevance to the public (McCombs & Shaw, 1972).

It is now known that the presence of brands in the media directly influences their reputation, as it shapes the public's perception and opinion of them, as Deephouse (2000), for example, argues when he defines media reputation as the overall assessment of a company by the media.

Media coverage is an omnipresent feature of modern life. It pervades newspapers, magazines, television, online media, and social networks and provides a vital source of information for public, corporate, and private audiences alike (Dyck & Zingales, 2002). The importance of media coverage measurement has been widely recognized by communications professionals, as evidenced by the findings of a recent report by PRWeek & Cision (2023). The measurement of media coverage has long been a key practice for public relations (PR) practitioners, offering valuable insights into public perceptions and the impact of communication initiatives (Michaelson & Macleod, 2007; Watson, 2012a). Studies have shown that media measurement provides valuable insights into how a brand or organization is perceived by the public, it is relatively inexpensive and accessible, and it has been used to demonstrate the value or influence of public relations activities (Eisenmann, 2012).

In the digital age, where news is disseminated across multiple platforms and channels—spanning media outlets, social media, and social networks on a minute-by-minute basis—brands must employ real-time, reliable metrics to monitor their media coverage. This enables them to assess their media reputation, identify potential crises, and evaluate the effectiveness of their communication strategies and interactions with the media. This premise has proved to be crucial to the work of communication professionals, not only as a way of reacting to events, but also as a support for planning their medium- to long-term strategy.

However, measuring media coverage in a comprehensive and effective manner poses a significant challenge. Despite having been discredited as a metric for measuring media coverage by several researchers as Macnamara (2006), Stacks & Michaelson, (2009), Watson (2012b) and by the leading industry organizations such as the International Association for the Measurement and Evaluation of Communication (AMEC), the Advertising Value Equivalent (AVE) is still a metric used repeatedly by a large proportion of communication professionals, a situation that is responsible for highlighting the relevance of introducing more realistic metrics in the process of measuring and comparing the immediate results of brands' media coverage. This fact has led to a pressing need for a more robust, reliable, and standardized metric to measure the output of media coverage.

1.2 Motivation

The topic of this thesis stems from the identified gap in integrated algorithms for the automatic and real-time measurement of media coverage, particularly within the context of brands. Despite advancements in the field, scientifically validated methods for such measurements remain limited. This deficiency likely contributes to the continued reliance of many communication professionals on 'vanity metrics' for assessing their media communication initiatives, as highlighted in recent studies (Bartholomew, 2016; University of Southern California's Center for Public Relations & The Holmes Report, 2016). Between 2001 and 2022, engagement with communication, marketing, and top management directors of leading Portuguese and Spanish companies further revealed the frequent use of metrics that fail to provide actionable insights or accurately evaluate performance.

This research aims to establish a connection between current scientific knowledge on the subject under study and the needs of the market, particularly communication and marketing professionals.

The integration of the metrics used in recent scientific trials, which have evaluated media coverage and its relationship with media reputation, into the evaluation algorithm, aims to respond to an emerging need in the market, which is to be able to evaluate the results of their communication and media relations initiatives in a way that is supported by science, leaving outdated and decontextualized metrics, which the

industry itself has already demonstrated do not allow communication to be evaluated, as expressed in AMEC's Barcelona principles (AMEC-International Association for Measurement and Evaluation of Communication, 2010, 2015, 2020).

Mcnamara (2017) argues that it is ironic that much of the PR industry tries to compare itself to advertising, when studies show that advertising has long been criticized for relying on metrics of reach and recall, rather than evidence of results or impact of communication with the target audience .

The aim is therefore to contribute to the development of scientific knowledge in this specific area and, through its practical application, to establish a direct connection between the academic work carried out and the market.

1.3 Research problem, questions and hypothesis

Brands and communication professionals need credible metrics that allow them to measure digital media coverage in near real time, so that they can identify trends in the information conveyed, detect communication opportunities and manage crises effectively, evaluate their media reputation and compare it with their competitors, and strategically intervene in the communication process, planning both their medium- and long-term strategies.

In response to this need, this thesis proposes a novel metric, grounded in recent scientific research, designed to objectively measure the media coverage output of brands in near real time, as the central research problem.

The research will be conducted to answer the following questions:

Q1. Can the output performance of digital media coverage of brands be measured using a single composite metric that combines brand objectives, media targeting, visibility, favorability, readership, and social amplification?

Q2. Can we establish a correlation between the Media Output Score and Reputation Score of brands?

The hypotheses, based on the research questions, are as follows:

H1. Measuring the favorability, visibility, potential audience and social media engagement of the news broadcast about a brand can be done automatically and allows

us to measure the media coverage of brands. This inductive hypothesis has digital media coverage as the dependent variable, while media favorability, media visibility, potential audience and social media engagement are complementary variables;

H2. Evaluating brands' digital media coverage makes it possible to compare their media performance and extract valuable insights from their results. This inductive hypothesis has digital media coverage as the dependent variable, and its complementary variable is whether it enables the comparison of brand performance and the extraction of valuable insights;

H3. The results obtained when applying the new metric developed make it possible to establish an interrelationship between the media reputation of brands and their corporate reputation. This inductive hypothesis considers the Media Output Score (MOS)—developed within the scope of this study—as the dependent variable, and with complementary variables being the media reputation score of the brands and their corporate reputation score;

The answer to these questions should represent an important step towards measuring media coverage in a digital context, supported by scientific knowledge, and towards the development of new approaches applicable across various sectors and using different datasets.

1.4 Research objectives

The object of this research will therefore be to measure the media coverage of brands near real time by developing an artifact for measuring the digital media coverage of brands. The prototype developed will be tested through a linear regression of the metrics that make it up and by comparing the results of measuring the media performance of the three largest operators in the telecommunications sector in Portugal between 2021 and 2023 with their respective reputational ratings.

To address this objective, the research employs linear regression analysis, which will be detailed and justified in the methodology chapter. Based on the general objective, which is to propose an algorithm that allows brands' media coverage to be measured in an integrated and automatic way using software, the specific objectives of this thesis are:

- To identify and justify the selection of metrics to measure digital media coverage;
- To develop and integrate these metrics into an algorithm that automatically evaluates the media coverage of brands;
- To design an artifact that can serve as a prototype for the development of software that allows communication professionals to measure the media coverage of their brands, establishing a relationship with their communication objectives and initiatives, benchmarking with other competing brands/initiatives and actively listening to current news in the context of their brands in order to be alert to emerging crises and opportunities;
- To test the algorithm developed with practical case case studies in the telecommunications and food retail sectors, with an emphasis on justifying the case selection and its relevance for the study's broader goals;
- To compare the results obtained from the new index with the reputation indices of the brands covered by the study, testing the connection between media reputation and corporate reputation based on established theoretical frameworks explored in the literature review.

1.5 Thesis structure

This thesis is organized into five chapters, each building upon the last to guide the reader through the development, validation, and application of the Media Output Score (MOS).

The first chapter presents the introduction, outlining the research problem, objectives, and hypotheses. This chapter also sets the stage for the exploration of how the proposed MOS can address gaps in media coverage measurement.

The second chapter conducts a thorough literature review, introducing key theoretical frameworks such as agenda-setting theory and media effects. It also delves into the influence of media reputation on corporate reputation, the importance of media coverage of brands in shaping media reputation, and a review of existing media coverage measurement tools. A special focus is placed on the inadequacies of the

Advertising Value Equivalent (AVE) metric, emphasizing the need for a more robust metric. The chapter concludes by establishing the theoretical foundation for the development of the new media coverage evaluation metric.

The third chapter will focus on the methodology used in the research. It explains the methodological choices made, particularly the adoption of a Design Science Research (DSR) approach, which is well-suited for developing practical solutions to complex problems. The chapter describes the metrics that form the basis of the Media Output Score (MOS), how they were selected, and the process of designing and validating the artifact. Justification for the choice of these metrics, as well as details of the algorithm's formulation, is also provided.

The fourth chapter presents the results of the two case studies: one in the telecommunications sector, involving the companies Altice/Meo, NOS, and Vodafone, and the other in the food retail sector, analyzing brands such as Auchan, Continente, Lidl, Mercadona, and Pingo Doce. This chapter also provides a comparative analysis of the MOS results and their relationship to corporate reputation scores. A discussion of the results, limitations and areas for future research are included.

The fifth and final chapter presents the conclusions of the thesis. It summarizes the key findings, discusses the contributions of the research to both academic knowledge and professional practice, and provides recommendations for future developments of the MOS.

^[1] Vanity metrics are numbers that look good on paper but are not action-oriented, such as website visits or message volume (Ries, 2010).

As Tableau defines it on its website, vanity metrics are metrics that make you look good to others, but don't help you understand your own performance in a way that informs future strategies. These metrics are impressive to make it look like results are improving, but they are generally not actionable and are not related to anything that can be controlled or repeated in a meaningful way. Vanity metrics are often compared to actionable metrics, which are data that help make decisions and help the company achieve its goals or grow. It's important to mention that any metric can be a vanity metric, and there are tell-tale signs that they are hollow metrics that look good on the surface but contain little substance. (Tableau, n.d.)

Chapter II – Literature review

This chapter provides a concise yet comprehensive overview of the literature, starting by exploring the premise of media effects. It reviews foundational concepts and the historical evolution of media effects, from early direct influence theories to more nuanced understandings of media's role in shaping public perception and behavior. The chapter outlines the primary theoretical framework guiding the analysis, emphasizing the agenda-setting theory and the one-step flow model, which suggests direct media influence. It also includes the two-step flow model, where opinion leaders filter media effects. Additionally, it reviews research on the role of interpersonal communication and opinion formers as key individuals who shape public opinion through their interpretation and dissemination of media content. The following chapter explores how media coverage impacts corporate reputation by analyzing the reciprocal relationship between media portrayal and corporate actions. It discusses the strategic importance of media coverage for brands and its significant impact on firm performance and valuation. Furthermore, it describes the measurement metrics, frameworks and methodologies used by the industry to assess media coverage, discussing best practices and emerging trends. It reviews the metrics used in recent academic research, particularly output metrics such as volume, sentiment, reach, and frequency. Finally, it critiques the use of AVE as a metric for measuring brand coverage, discussing its limitations and the urgency of changing this industry practice.

This literature review sets the stage for deeper analyses and discussions in this thesis, providing a foundation of theoretical insights and empirical evidence on measuring media coverage as a critical need for brands to understand the media effects and align their communication.

2.1. The premise of media effects

Most studies of mass communication are based on the premise that the media have significant effects, although there is little consensus on their nature and extent. This uncertainty is particularly surprising given that everyday experience provides numerous, albeit minor, examples of the existence of influence (McQuail, 2005).

The thesis defended in academic literature that there were minimal or no effects by researchers such as Kartz & Lazarsfeld (1955) and Klapper (1960) soon began to be challenged by those who doubted that the issue had been conclusively resolved. There was plenty of contemporary evidence, of a circumstantial nature, that the media could indeed have important social effects and be an instrument for exercising social and political power. Retrospective and authoritative descriptions of this period, such as those by Lang & Lang (1981), McGuire (1973) and McLeod et al. (1991), cast considerable doubt on the existence, at some point, between the belief in the power of the media and the belief in the powerlessness of the media.

Regarding the effects on public opinion, Lang & Lang (1981) argued that the "minimal effect" conclusion is just a given interpretation that has gained undeserved value. For the authors, 'the evidence available at the end of the 1950s, even when compared with some of the negative results, does not justify a general conclusion of media impotence'.

The work on media texts, especially news, and audiences, and also on media organizations, which emerged at the end of the 1970s, introduced a new approach to media effects known as "social constructivism" (Gamson & Modigliani, 1989). The origins of this new phase of research are diverse and trace back to the deep past. This new way of thinking maintains similarities with the previous theory of "powerful media" by including, for example, the theory of ideology and false consciousness, Gerbner's "acculturation theory" (Signorielli & Morgan, 1990) and the ideas elaborated by Noelle-Neumann (1974) in her theory of the "spiral of silence".

This emerging paradigm of effects has two main aspects. Firstly, the media "construct" social formations and even history itself, in both fiction and news by fixing images of reality in predictable and standardized ways. Secondly, audiences construct their vision of social reality and their place within it through interaction with the symbolic constructions offered by the media. This approach makes it possible to take into account both the power of the media and people's power of choice, amidst continuous negotiations.

Even before we leave the historical aspects of media effects research, it is worth reflecting on Carey (1988) suggestion that variations in the belief in the power of mass communications may have a historical explanation - the shift in the understanding of media effects, from a strong model to a more limited one and then back to an even

stronger model, can be explained by the fact that significant changes occurred in society during this time.

This historical perspective aligns with findings from Carrage et al. (1987) that agenda-setting theory helped shift the emphasis from studying short-term attitudinal effects to a more longitudinal analysis of social impact.

Furthermore, the contrast in perspectives between the traditions of limited effects and indirect effects is well captured in Cohen (1963) famous saying that the press may not often dictate what people should think, it is highly effective at shaping what issues people focus on.

2.2. Theoretical framework

In their first empirical test of the agenda-setting hypothesis, McCombs & Shaw (1972) argued that mass media shape the priorities of each political campaign by influencing the importance placed on certain political issues.

Agenda-setting is the process by which the media creates public awareness and concern about certain issues. In this process, a wide range of news topics is filtered and reduced to a few that are presented to the public. This concentration on specific issues or subjects makes the public perceive them as more important than others (McCombs & Shaw, 1972).

Agenda-setting theory is a tool for investigating the comprehensive communication process by which media professionals, the public, and elites compete for the media's limited resources of influence. Media salience is the primary variable in agenda-setting theory, and since the beginning of these studies, researchers have recognised that it has more than one dimension. Three dimensions of media salience have emerged in the literature: attention, prominence and valence (Kiousis, 2004).

The main hypothesis of agenda-setting theory is that the media influence the topics people consider relevant or important. This theory was developed and introduced half a century ago by McCombs & Shaw (1972). Since then, it has generated numerous theoretical and empirical works and has undergone several adaptations. Notably, one adaptation includes defining a second level of agenda-setting (McCombs et al., 1997; Carroll & McCombs, 2003), which indicates that the media not only affect what the

public perceives as relevant, but also how the public thinks about a topic or some of its attributes.

Studies on agenda-setting theory have primarily focused on political issues (Funkhouser, 1973; Palmgreen & Clarke, 1977; Smith, 1987; Winter & Eyal, 1981) and aimed to establish links between media coverage and the attention given to issues by the public. Researchers have demonstrated the existence of these links by showing that when the public was asked to identify issues they considered important, they named the most prominent issues in the media.

Carroll & McCombs (2003) demonstrated that the general theoretical concepts of first and second level agenda-setting also apply to corporate communication. By highlighting companies in media coverage, the media also increase the public relevance of these organizations - the first level of agenda-setting. By emphasizing certain attributes of companies and ignoring others, the media also influence the way the public evaluates these organizations - the second level of agenda-setting. In media coverage, substantive and evaluative attributes are combined, which according to the second level of agenda-setting, results in similar or identical patterns of public evaluation of organizational attributes.

Carroll (2011) noted with some surprise that in the first 30 years of research into agenda-setting theory, researchers missed a fundamental change in the aggregate media agenda: the rise of business news. With the creation of the Internet, and the increasing savviness of ordinary citizens about investing in the stock market, followed by the loss of their savings in economic crises, business news, in its various forms, became an increasingly significant part of the media and the public agenda.

The main focus of agenda-setting theory applied to business news has been in the field of corporate reputation (Carroll & McCombs, 2003). However, some research has also examined the connection between media coverage and share prices or the general financial performance of companies, such as the study conducted by Deephouse (2000).

Corporate reputation is a concept with at least three dimensions: a company's public prominence, its public esteem, and the series of qualities or attributes for which a company is known. This concept has garnered considerable interest among researchers and practitioners, because it relates to a company's ability to increase market share, reduce market costs, reduce distribution costs, charge a premium, avoid over-regulation,

navigate difficult times, align employees, attract and retain talent, attract investors, gain access to new markets, and secure more favorable news coverage (Dowling, 2001).

The general assumptions of agenda-setting theory in a business context have been supported by various empirical works, such as those by Eisenegger et al. (2010), Hester & Gibson (2003), Meijer & Kleinnijenhuis (2006) and Ragas (2013).

A generally accepted consequence of media effects within the agenda-setting structure is "priming" (Iyengar & Kinder, 1987; McCombs, 1993; McCombs & Reynolds, 2002), the process by which certain issues start to concern the public and become top-of-mind for decision-making.

In light of these established effects, it is crucial to consider how digitalization is rapidly changing the communication environment for brands, and how new communication channels are challenging the traditional role of the news media as the main agenda setters. This includes the influence of the media in shaping companies' reputations (Etter et al., 2019).

Chadwick (2017) emphasizes that the modern media landscape has become significantly more diverse, fragmented, and polycentric, with new practices emerging as a result of digital communication's growth.

Vogler & Eisenegger, (2021) analyzed the effect of the communication of Corporate Social Responsibility (CSR) issues on the corporate reputation of companies in Switzerland through media coverage and Facebook. The results of this longitudinal study show that the salience and tone of media coverage of CSR were positively related to corporate reputation, although media coverage of CSR was predominantly negative; on the other hand, no effect of CSR communication via Facebook on corporate reputation was found. The results suggest that traditional media are still influential in determining how the public evaluates corporations in the digital age. The authors highlight the significant role of traditional media in shaping corporate reputation, understanding the underlying mechanisms of media influence on public perception is crucial. This can be further elucidated by examining different models of media communication.

The one-step flow model, as described in the hierarchy of effects model, suggests that consumers follow a linear progression from exposure to a product or brand to the final decision to purchase (Nugroho et al., 2022). This model assumes that media messages

have a direct and unmediated impact on audience attitudes and behaviors, with individuals moving sequentially through stages of awareness, interest, evaluation, trial, and adoption. However, this perspective has been challenged by the two-step flow model, which suggests a more nuanced and complex process of media influence.

According to this model, media messages first reach opinion leaders, who then relay and interpret this information for their social networks (Wright, 1974; Rehman et al., 2014). Opinion leaders, characterized by their high levels of engagement, expertise, and social influence, play a crucial role in shaping how media content is perceived and acted upon by the general public. This suggests that interpersonal communication, rather than direct media exposure, may be the primary driver of attitudinal and behavioral change (Siegel, 2013).

This understanding is reinforced by empirical research that supports the two-step flow model, highlighting the importance of social networks and opinion leaders in shaping media effects. Studies have shown that opinion leaders are more likely to be early adopters of new products and ideas, and that their endorsements and recommendations can have a significant impact on the decisions of their peers (Nugroho et al., 2022).

In the ever-evolving landscape of media consumption and information dissemination, the role of opinion formers has become increasingly significant in shaping the public's perception and understanding of various issues. Opinion formers, often referred to as "influencers," are key figures who can significantly impact the way information is interpreted and disseminated within the public sphere (Li et al., 2006; Helfmann et al., 2023).

One of the central questions in this area is the extent to which opinion formers can manipulate public opinion, as opposed to simply reflecting or amplifying existing sentiments. While it is evident that elites, interest groups, and political parties can influence public opinion, they are also constrained by it, and the separate impacts of opinion versus elite and organizational activities are often difficult to disentangle (Burstein, 2003). As such, it is important to recognize that public opinion is not simply the product of elite manipulation, but rather the result of a complex interplay between various social, political, and media-driven factors.

This understanding is further complicated by the rise of social media and the emergence of influencers as a new class of opinion formers. Influencers, who are private

individuals with a large following on social media, have the potential to polarize public discussions and compete with traditional media for audience attention. This increased competition may contribute to the declining trust in mainstream media and the proliferation of polarized debates on social media (Helfmann et al., 2023). At the same time, brands and companies also leverage the reach and influence of these social media personalities, paying them to endorse and promote products, further blurring the lines between commercial and political messaging.

This complexity is further highlighted by the role of influencers in the digital age, which is still less understood compared to traditional elites and interest groups. While the impact of traditional elites and interest groups on public opinion is well-documented, the role of influencers in shaping public discourse is less understood. Some research suggests that influencers can have a significant impact, particularly when they act as "intermediary-senders," with their party affiliation and the nature of their audience playing a key role (Riego & Villarba, 2023). Influencers may also contribute to the declining trust in traditional media, as they compete for audience attention and potentially polarize debates (Helfmann et al., 2023).

Building on the discussion of how influencers and opinion leaders shape public perception, it is also crucial to consider the role of traditional news media in shaping corporate reputation.

2.3. The influence of media reputation on corporate reputation

Exploring the factors that shape corporate reputation, it is essential to understand the pivotal role of news media. The news media are believed to play a central role in shaping organizational reputation because "they control both the technology that disseminates information about companies to large audiences and the content of the information disseminated" (Rindova et al., 2006). The news media direct the public's attention to the organizations they cover and influence stakeholders' evaluations of organizations by selectively presenting and framing information about them (Carroll & McCombs, 2003; Pollock & Rindova, 2003). Researchers have therefore introduced the term "media reputation" to refer to "the general evaluation of a company by the media" (Deephouse, 2000), and have extensively investigated how media reputation contributes to the formation of collective reputational judgements. Based on these studies,

researchers argue that, although it is not the only source of influence on reputational judgements, the news media does have an important effect on how individuals evaluate organizations, especially when they have no direct exposure to their products or services (Carroll, 2010). Even when their judgements differ from the accounts offered by the news media, individuals may be reluctant to publicly contradict these authoritative "evaluators", implicitly agreeing with the validity of their assessments (Bitektine & Haack, 2015).

Research on media reputation usually focuses on the coverage of a few identifiable news outlets, selected on the basis of "authority" and "circulation" (Deephouse, 2000; Deephouse & Carter, 2005; Zavyalova et al., 2012), under the assumption that the evaluations adequately capture the information content made available to the public. While some researchers explicitly state that the news media exert an overwhelming influence on collective judgements, the assumption of a "strict alignment between media content and public opinion" (Deephouse & Carter, 2005) is so widely accepted that coverage by the most prominent media is often used as a proxy for measuring organizational reputation (Rindova et al., 2007; Zavyalova et al., 2012). Such an approach has the undeniable benefit of simplicity.

To establish a correspondence between the media coverage evaluation, which will lead us to the media reputation achieved, and the respective corporate reputation, several previous studies have used secondary data obtained by professional organizations. For example, Fomburn and Shanley (1990) and Wartick (1992) used "Fortune's Most Admired Companies", Carrol (2004, 2009; 2011) and Kiousis et al (2007) used the "Harris Poll Reputation Quotient" created by Harris Interactive and the Reputation Institute, now called RepTrack.

Carrol (2011) has edited a compilation of research papers that examine how agenda-setting theory applies to the influence of news on corporate reputation. Carrol (2011) presents interdisciplinary, international and empirical research that examines the relationship between corporate reputation and the news media around the world. With research in over 25 countries, this compilation studies local media behavior and business communities, representing developed, emerging and frontier markets - including Argentina, Brazil, Chile, China, Germany, Greece, Japan, Nigeria, Turkey and Spain, among others. The chapters present primary and secondary research on various

geopolitical issues, the nature of the media, public relations practice and the role of public relations agencies in each of the various countries.

Each chapter is structured to consider two to three hypotheses on the country under discussion, including:

- the impact of media visibility on organizational prominence, recognition of prominence and brand recognition.
- the impact of media favoritism on the organizational image of these companies by the public.
- how media coverage of specific public issues and news topics relates to the associations people form with specific companies.

The researchers contextualize their findings in the light of the geopolitical environment of their home countries, the nature of their media systems and the relationship between companies and the media in their countries.

This detailed examination of media influence in various geopolitical contexts sets the stage for a deeper exploration of how media coverage affects individual brands and their market performance.

2.4. The media coverage of brands

Media coverage of companies is omnipresent. Whether in newspapers or magazines, online or on television, or in general or specialized publications, reports on companies permeate most aspects of public, corporate and private life (Dyck & Zingales, 2002). On the other hand, media reports are often the main legitimate source for reducing information asymmetries about a company's shares (Deephouse, 2000). Academic research has shown substantial evidence that media coverage is an important strategic asset that can significantly affect the performance and valuation of companies (Ahern & Sosyura, 2014; Rogers et al., 2016), as well as resource allocation decisions (Desai, 2014), investor trading patterns (Liu et al., 2014; Pollock & Rindova, 2003) and customer purchasing behavior (Berger et al., 2010; Stephen & Galak, 2012). However, research on this topic is fragmented across various disciplines in the business sciences, such as management, accounting or marketing, which has resulted in a great diversity of theoretical frameworks, configurations and empirical methods (Carroll & Deephouse, 2014).

Graf-Vlachy et al. (2020) note that, although there are consistent and well-cited literature reviews on aspects of media coverage in disciplines such as sociology (Shoemaker & Reese, 2013), communication (McCombs et al., 1997) and journalism (Schudson, 2003), these do not focus on companies. From a literature review to provide an interdisciplinary but management-focused overview of media coverage of companies, the authors find that researchers using different theoretical lenses tend to diverge on the mechanisms underlying the formation and influence exerted by media coverage of companies. However, this mainly results in different explanations for the same phenomena, rather than contradicting predictions. To this end, they propose an integrated framework for corporate media coverage that transcends the theoretical boundaries erected by economic, institutional and socio-psychological conceptualizations of news, integrating antecedents, attributes, consequences and moderators from an interdisciplinary body of research. This integrated framework lays the groundwork for understanding how to measure the impact of media coverage on corporate reputation, which is explored in the following section.

2.5. The media coverage measurement

In recent years, media coverage measurement has become an increasingly important aspect of brand management. It is crucial for businesses to understand the impact of media coverage on a brand's reputation using comprehensive measurements, as it aids in making informed decisions and developing effective communication strategies. However, the task of measuring media coverage can be complex and challenging. Historically, media coverage measurement involves quantifying the number of news stories about a particular company or estimating the potential number of people who have been exposed to the news (Watson & Noble, 2014). Despite the rise of social media, traditional media continues to play a crucial role in public relations and its measurement (Sommerfeldt et al., 2019). Michaelson & Stacks (2011) argue that public relations measurement needs to be standardized to demonstrate the impact of communication activity, both in absolute terms of impact and relative measures. Michaelson et al. (2017) explore the root cause for the lack of adoption of standardized measures to evaluate PR activity. They propose a message delivery-based approach, supported by an analytical approach proposed by (Michaelson & Griffin, 2005) that is underpinned by message-level content analysis.

Over the past 40 years multiple models for PR evaluation have been developed, widely discussed in various scientific articles, such as "Evaluating Public Relations: A Best Practice Guide to Public Relations Planning, Research and Evaluation" (Watson & Noble, 2014) and "Evaluating Public Communication: Exploring New Models, Standards, and Best Practice" (Macnamara, 2017).

Academics and practitioners recognize evaluation as a major challenge, and since 2010, several initiatives have been launched to develop standards and best practices in PR evaluation - what one industry article calls the 'march to standards' (Marklein & Paine, 2012). Recent significant steps include the adoption and promulgation of the Barcelona Principles in 2010, which were updated in 2015 and 2020 (AMEC-International Association for Measurement and Evaluation of Communication, 2010, 2015, 2020), and the establishment of the Coalition for Public Relations Research Standards and the Social Media Measurement Standards Conclave in 2011 (Conclave on Social Media Measurement Standards, 2011). These initiatives involved several professional organizations.

The Internet has changed fundamentally the context in which people consume news (Messing & Westwood, 2012). The evolution of online news consumption behaviors, such as recommending or sharing news articles, encourages scholars and practitioners to take new perspectives into the news evaluation in the digital era. Given the important role of perceived news quality in the public's message acceptance and decision making (Sundar et al., 2007), understanding the factors that affect online news evaluations, as well as the underlying mechanisms, will provide scholars and practitioners with meaningful insights into how to understand news consumption and manage media messages in the digital era (Chung, 2017).

The public plays a key role in the dissemination and evaluation of news content, and one of the big questions facing news organizations is what elements make content viral in the digital environment. Over the past 20 years, the digital revolution has changed distribution and communication practices between news organizations and the public. Social media platforms have played a prominent role in connecting news outlets to increasingly social and participatory online audiences (García-Perdomo et al., 2018).

Click, share, like, and comment on social media are powerful forms of distribution (Tenenboim & Cohen, 2015) that privilege and challenge news values, as one-third of

Internet users participate in the creation of news dissemination through social media (Purcell et al., 2010).

Investigating situational factors, Berger et al. (2010) concluded that content that evokes strong positive or negative feelings becomes more shareable than stories that evoke low ratings. In fact, the researchers came to a recurring conclusion: content that excites users is more easily shared and has the potential to go viral (Dobele et al., 2007). Kim (2015) found that users share more news articles that have controversial and emotional features. Similarly, interesting content, trust in sources, and news values such as controversy, relevance, or surprise have a strong association with news sharing (Rudat et al., 2014).

Robertson et al., (2023) focused on the causal impact of emotional language on news consumption by analyzing over 105,000 headlines and more than 370 million impressions from Upworthy.com. Their findings supported the negativity bias hypothesis, showing that headlines with negative language significantly increased click-through rates (CTR) by 2.3% for an average-length headline. Conversely, headlines with positive language were associated with a decrease in CTR by approximately 1.0%.

Considering the networked audience, an analysis of social recommendations is critical, as understanding not only what content users will want to consume, but also what content they are likely to broadcast can be a key to how stories are put together and even which stories are covered first (Olmstead et al., 2011). Therefore, knowing what topics and stories are shared across social media provides a better understanding of networked news flow and how social media is disrupting other flows and reshaping the industry's relationship with audiences (Hermida et al., 2013).

Click, share, like, and comment on social media are powerful forms of distribution that privilege and challenge news values, as one-third of Internet users participate in the creation of news dissemination through social media. (Purcell et al., 2010; Tenenboim & Cohen, 2015).

For news organizations, the editorial analytics captured online near real time represent a significant improvement to understand the media environment in which they operate and an important shift from a time in which newsrooms had far less analytic capability than other parts of their organization. (Cherubini & Nielsen, 2016). The idea of

integrating analytics into daily editorial work and longer-term strategic planning has been central to US-based digital news start-ups like Gawker, the Huffington Post, and BuzzFeed for years. These companies have from the start been proud of their ability to use a more data-informed and evidence-based approach to digital publishing than many older media, and have drawn extensively on analytics developed in the technology sector, marketing, e-commerce, and advertising (Petre, 2015).

The importance of media coverage measurement has been widely recognized by communications professionals. This is evidenced by the findings of a recent report by PRWeek & Cision (2023). The report, based on a survey of 440 high-level professionals, from both agency and in-house backgrounds, found that 61% of respondents placed media coverage measurement as one of their top four struggles. Additionally, 22% consider it their top priority, citing the "inability to measure impact effectively" as a key challenge.

The communication professionals are experiencing the following six specific challenges:

- aligning metrics with revenue or other vital business indicators (50%);
- converting data into actionable insights (50%);
- continued over-reliance on media impressions (49%);
- identifying the best tools to measure more effectively (41%);
- lack of access to effective measurement tools (23%);
- proving/validating PR impact for the C-suite (21%).

There is a distinction between measuring media coverage using media metrics and analyzing media coverage to extract insights. This distinction establishes the difference between public relations measurement and evaluation and that will serve us to define the scope of this work in measurement rather than analysis.

While measurement is concerned with collecting and counting data in a quantifiable or numerical manner, evaluation is more subjective and requires interpretation and determination of whether communication activities are helping an organization meet its goals (Buhmann & Likely, 2018; Lindenmann, 2003).

It is not uncommon for public relations professionals to stop at the activity-level measurement stage, exemplifying what has been referred to as the public relations

measurement plateau, in which professionals focus on output-level metrics (Macnamara, 2017).

Recent studies have attempted to explain the public relations measurement status quo (Nothhaft & Stensson, 2019; Romenti et al., 2019). These studies highlight the necessity for communication professionals to evaluate the outcomes of their initiatives. Additionally, they emphasize the importance of having output-level metrics that allow for objective and preferably real-time measurement of media coverage.

Using output metrics to measure media coverage, allows organizations to measure the reach, engagement, and overall effectiveness of their media coverage. By analyzing metrics such as reach, impressions, click-through rates, and social media interactions, organizations can gain valuable insights into the success of their media campaigns and make informed decisions on how to improve their strategies. Additionally, measuring the relative positions of media outlets and analyzing implicit and explicit bias can provide further insights into the overall impact of media coverage (Puglisi & Snyder, 2015). Furthermore, in the context of social media marketing communications, it is essential to develop a conceptual framework for measuring the effectiveness of these strategies. This includes continuously monitoring the content and activities on social media channels, as well as measuring the effectiveness of social media use for marketing purposes. The proposed evaluation framework allows companies to perform social media analytics and measure the impact of their marketing efforts on social media platforms (Pletikosa Cvijikj & Michahelles, 2013). By tracking and analyzing metrics such as engagement, reach, impressions, click-through rates, and social media interactions, companies can assess the effectiveness of their social media marketing communications and make data-driven decisions to optimize their strategies (Töllinen & Karjaluoto, 2011). Additionally, it is important for companies to establish clear objectives and align their marketing tactics with their overall business strategy. This will ensure that the metrics being measured align with the company's goals and provide meaningful insights into the effectiveness of their marketing efforts (Fatin & Rahman, 2020). Furthermore, the transition to a media publishing mindset requires organizations to adapt their content production process by shifting from an advertising agency model to a newsroom model. This allows them to create content at the speed of culture and effectively engage with their target audience. By utilizing metrics to determine the success of content marketing, organizations can measure the increase in volume and

quality of visitor interactions, as well as track engagement and conversion metrics tied to their specific goals. Overall, the measurement of media coverage and marketing performance is crucial for companies to assess the effectiveness of their strategies, make data-driven decisions, and optimize their marketing efforts to achieve their desired business outcomes. Ultimately, the adoption of a comprehensive evaluation framework that encompasses both quantitative and qualitative metrics can provide organizations with a holistic understanding of their marketing impact and inform future initiatives (Arora et al., 2014; Murdough, 2009; Petersen et al., 2009; Töllinen & Karjaluoto, 2011).

Companies must also consider the technological, social, economic, and ethical dimensions when evaluating their social media presence and performance. By tracking key metrics such as reach, engagement, and conversion rates, organizations can gain valuable insights into the success of their social media marketing strategies and make adjustments to better align with their overall business objectives (Arora et al., 2014).

For instance, Ambler et al. (2001) propose that effective marketing metrics should be limited to high-level, quantifiable, and auditable performance measures that are necessary and sufficient to evaluate marketing efforts. Such an approach can provide companies with a clear understanding of how their marketing activities are contributing to desired business outcomes, enabling them to optimize resource allocation and justify marketing expenditures.

Moreover, the transition to a media publishing mindset, as discussed by the sources, requires organizations to adopt a content production process akin to a newsroom model. This allows them to create timely, relevant content that effectively engages their target audience (Petersen et al., 2009). By utilizing metrics to determine the success of content marketing, organizations can measure the increase in visitor interactions, as well as track engagement and conversion metrics tied to their specific goals. The careful selection and analysis of marketing communication metrics, including those specific to social media, can help businesses maximize profitability and shareholder value.

2.6. Measuring media reputation based on media coverage

Public relations metrics fall into three categories: outcomes, outtakes, and results. In the public relations measurement and evaluation literature, basic outcome metrics include

press clipping counts, target audience reach, and share of voice; outcome-level metrics, which take into account audience action, include views, clickthrough, and tone; outcome-level metrics, which are the most desired public relations effects but still the most difficult to measure, include awareness, attitudes, trust, reputation, and relationships (Macnamara, 2014a).

Academic and professional research has found that public relations practitioners measure the success of their communication initiatives reflected in metrics at the level of outputs and outtakes (Buhmann & Likely, 2018; Schriener et al., 2017; Zerfass et al., 2017).

Frequency (i.e., number of articles in the media about a company), Reach (i.e., potential number of individuals exposed to articles about a company), Share of voice (i.e., percentage of a company's articles compared to its competitors) or Tone (i.e., whether media coverage is positive, neutral or negative) are limited metrics because they focus on the intermediary of a message (the media) and do not account for how the audience feels about the message or what they did after seeing it (Michaelson & Macleod, 2007). However, the insights that can be extracted from media measurement are an important part of the public relations process and can link to business outcomes. (Macnamara, 2014b).

According to public relations measurement models, such as the preparation, implementation, and impact (PII) model (Cutlip et al., 1985), the public relations effectiveness parameter (Lindenmann, 1993), and the AMEC integrated evaluation framework (AMEC-International Association for Measurement and Evaluation of Communication, 2016), measurement of public relations activities, such as media placement, is an essential part of the public relations measurement process.

Public relations practitioners often rely on production-level metrics to measure their performance or perceive positive media coverage as evidence of their success or proof of the value of public relations (Buhmann & Brønn, 2018; Buhmann & Likely, 2018; Zerfass et al., 2017). Even award-winning public relations campaigns emphasize these metrics (Schriener et al., 2017). Recognizing this measurement challenge in the profession, the Barcelona Principles recommend that public relations professionals measure not only the quantity but also the quality of media coverage. Stating that "overall clip counts and overall impressions are generally meaningless," the Barcelona Principles explain that measurement of traditional media should also take into account

"impressions among the stakeholder or target audience, the quality of media coverage, including but not limited to tone, credibility and relevance of the medium to the stakeholder or audience, message delivery, inclusion of a third party or company spokesperson, and prominence as relevant to the medium" (AMEC-International Association for Measurement and Evaluation of Communication, 2015).

Scientific research, both in the field of business management and in the field of communication sciences, has been acquiring a variety of metrics to measure media reputation (Zhang, 2016).

In most of the studies developed to date, to carry out the measurement of media reputation, researchers have resorted to the modified Janis-Fadner imbalance coefficient proposed by Janis & Fadner (1943), including studies by Carroll (2004, 2009), Bansal & Clelland (2004), Deephouse (1997, 2000) and Pollock & Rindova (2003).

Given the complexity and importance of measuring media reputation, various indices have been developed to provide more accurate and comprehensive analyses of media coverage. Each of these metrics provides unique insights into media reputation.

2.6.1 Janis-Fadner Index

The Janis-Fadner imbalance coefficient is one such tool that has proven valuable. The original Janis-Fadner imbalance coefficient (Janis & Fadner, 1943) is calculated by the formula shown in image 1.

Image 1

Original Janis-Fadner imbalance coefficient formula

$$y = \begin{cases} \frac{f^2 - fu}{r \cdot s}, & \text{if } f > u \\ 0 & \text{if } f = u \\ \frac{fu - u^2}{r \cdot s}, & \text{if } u > f \end{cases}$$

Where f = number of favorable (positive) coding units; u = number of unfavorable (negative) coding units; r = total number of relevant coding units, including favorable, unfavorable, and neutral; and s = total number of relevant and irrelevant coding units.

2.6.2 Deephouse media endorsement index

Deephouse (1995) and Bansal & Clelland (2004) used the same formula as the Janis-Fadner imbalance coefficient but assigned different names to the coding units.

- Deephouse (1995) used endorsing (e) and challenging (c) coding units
- Bansal & Clelland (2004) used favorable (e) and unfavorable (c) coding units.

Since the original Janis-Fadner coefficient used favorable (f) and unfavorable (u) coding units, as do most other studies, it was assumed that "endorsing" is the same as "favorable" and "challenging" is the same as "unfavorable." It should also be noted that both Deephouse (1995) and Bansal & Clelland (2004) did not code neutral units and therefore neutral units are not included in the denominator represented by the formula shown in image 2.

Image 2

Deephouse media endorsement index formula

$$y = \begin{cases} \frac{f^2 - fu}{r^2}, & \text{if } f > u \\ 0 & \text{if } f = u \\ \frac{fu - u^2}{r^2}, & \text{if } u > f \end{cases}$$

Where f = number of favorable coding units, u = number of unfavorable coding units, and r = total number of favorable and unfavorable coding units.

2.6.3 Deephouse media favorability index

Deephouse (2000), Pollock & Rindova (2003), and Carroll (2004, 2009) also used this transformed formula, derived from the Janis-Fadner imbalance coefficient but included the neutral coding units in r , i.e. r = the total number of relevant coding units, including positive, negative and neutral coding units. In addition, this application differs from the original Janis-Fadner imbalance coefficient because it replaces t , which is the total number of relevant coding units and irrelevant coding units, with r , where only the relevant coding units are included. Janis & Fadner (1943) defined relevant content as the total number of content units that contain the attribute under investigation and irrelevant content as the content units in which the attribute does not occur.

2.6.4 Fombrun and Shanley Index

Fombrun & Shanley (1990) developed a media reputation index that excludes negative evaluations, that is media reputation is equal to the sum of the proportion of positive evaluations and neutral evaluations represented by the formula shown in image 3.

Image 3

Fombrun and Shanley Index formula

$$y = f + n$$

Where f =proportion of positive coding units and n =proportion of neutral coding units.

2.6.5 Wry Index

Wry et al. (2006) developed another linear model to assess media reputation, in which the reputation index results from the ratio of positive ratings to negative ratings (Image 4).

Image 4

Wry Index formula

$$y = f - u$$

Where f = proportion of positive coding units and n = proportion of negative coding units.

2.6.6 Kiouisis index

Kiouisis et al. (2007) used only positive tone as the only measure of reputation (Image 5).

Image 5

Kiouisis Index formula

$$y = f$$

Where f = proportion of positive coding units.

2.6.7 Meijer and Kleinnijenhuis index

Meijer & Kleinnijenhuis (2006) developed a measure that combines media favorability and media visibility. Depending on tone, the authors assigned +1, +0,5, 0, -0,5, and -1, when the news was positive, partially positive, neutral or balanced, partially negative, or negative, respectively. They then summed the values as measures of media reputation, according to the formula shown in image 6.

Image 6

Meijer and Kleinnijenhuis index formula

$$y = \sum_{1}^n t_i$$

Where t_i is the value assigned to the tone of news item i , which is one of the numbers +1, +0.5, 0, -0.5, -1; and n is the total number of news items.

2.6.8 Media Reputation Index

In his doctoral dissertation, Zhang, (2014) finds that, as defined by Deephouse (2000), media reputation is an overall assessment of companies' media coverage, so media favorability should be only one of the aspects to consider for the assessment of media coverage. Media visibility and recency are other aspects to consider. Agenda-setting and Priming theories argue that these three factors will influence people's perceptions simultaneously.

Based on the interaction between media favorability, media visibility, and recency, Zhang (2014) developed a new measure of media reputation and used this measure to test the associations between media reputation and corporate reputation.

Manheim (2011) maintained that media visibility consists of two factors: attention and prominence. Attention is defined as the media awareness of an object, usually gauged by the large volume of stories or spaces devoted to issues in newspapers, television news, etc., and prominence as the positioning of a story within a media text to communicate its importance (Kioussis, 2004).

To further quantify the concept of prominence, Bowen et al. (2005) and Distaso (2007) developed a three-point scale to measure prominence:

- the prominence score is three when the subject appears in the title;
- is two when the subject appears in the first paragraph;
- is one when the subject appears in other parts of the text.

Kiouis (2004) argued that media attention, prominence, and valence/tonality are three facets of media salience. Building on this framework, several studies have shown that media visibility and tonality are interlinked. For example, Kiouis et al. (1999) suggested that the tonality of news can affect the overall salience of objects. Zyglidopoulos & Georgiadis (2006) proposed that media favorability should combine two key factors of news relevance: attention and prominence.

The Network Model of Memory, which is the psychological basis of the Priming Theory, suggests that recent messages have more influence than non-recent messages due to the short-term accessibility of related constructs in memory (Higgins et al., 1985). Several studies around Priming Theory have shown that recent exposure to media coverage has stronger priming power than non-recent exposure (Ewoldsen et al., 2008).

Zhang (2014) notes that in exploring the influence of media coverage on corporate reputation, most previous studies have not explored the recency effect. Wartick (1992) conducted an exploratory study on this effect. He argued that more recent media coverage was associated with a greater change in corporate reputation, and the direct change paralleled the tone of the media coverage.

To quantify this relationship, Wartick (1992) developed a recency measure. He divided a year into 24 fortnightly periods and assigned a value to each period. The most recent periods have higher values than the more temporally remote periods. For example, the most recent two-week period is assigned 24. The least recent two-week period is assigned 1.

Following this reasoning, Zhang (2014) examined the influence of the interaction between recency and media favorability on corporate reputation, where the interaction was measured by multiplying the two variables.

The Media Reputation Index is the variable proposed in Zhang's dissertation (2014). It is based on the analysis of the interactions between media favorability, media visibility and recency and is represented by the formula shown in image 7.

Image 7

Media Reputation Index formula

$$MRI = w \times MF$$

Where w represents the weight of the combination of media visibility and recency ($w = MV \times R$) and MF represents media favorability. MV stands for media visibility and R for recency.

The formula proposed by Zang, in addition to being based on media favorability, like the previous formulas, has the advantage of combining it with media visibility and recency, giving the formula a dimension of frequency of repetition given by visibility that has not been explored by previous researchers.

However, Zang's formula, as well as being very much aimed at evaluating news published in the written press, was not scaled according to the audiences, reach or circulation of the media, which limits it as a way of evaluating media performance. The application of this formula to digital media is therefore very limiting in that recency cannot be applied to a real-time evaluation and the formula does not provide for any kind of oversizing considering the interaction of news on social networks.

2.6.9 Media monitoring industry formulas to measure digital media coverage

The digital media monitoring industry has sought to respond to the need to evaluate media coverage, adding audience and interaction with news on social networks to the previous formulas. Despite not having a sustained scientific basis, these formulas introduce important metrics for evaluating performance in the digital space and have therefore been taken into account in the construction of our measurement artifact.

News Media Reputation Index (Newswhip, 2015), focuses on digital news media. Analyzes frequency, sentiment, and reach of news articles and mentions. The formula components are the number of news articles, the tone of the articles, the audience size of the news outlet and the credibility of the news source.

Digital Media Influence Index (Brandwatch, 2016) measures the influence of digital media coverage on public perception and brand reputation. Analyzes volume, sentiment,

and reach of digital mentions across online platforms. The components of the formula are the number of mentions, tone of the mentions (positive, negative, neutral), the potential audience size of the mentions and the interactions with the content (likes, shares, comments).

Influencer Impact Index (Traackr, 2016) measures the impact of influencers on digital media reputation. Assesses reach, sentiment, and engagement generated by influencers. The components of the formula are the reach and credibility of the influencer, the tone of influencer content and the interactions with influencer content.

Online Visibility and Sentiment Index (Meltwater, 2019) measures visibility of a brand in digital media and sentiment of mentions. The components are the frequency and prominence of mentions, the tone of the mentions, the audience size of the mentions.

2.7. Critique of Advertising Equivalent Value (AVE) as a Metric for Evaluating Media Coverage

Although discredited for measuring media coverage by professional organizations and scientific research, Advertising Value Equivalent (AVE) is still used by a significant number of communication professionals to report the results of their work.

AVE measures the space occupied by a news item and applies to it the cost value for the purchase of an equivalent advertising space in the same medium (Institute for Public Relations, 2021).

The Barcelona Principles, developed by the Association for the Measurement and Evaluation of Communication as a comprehensive model for measuring communications, state that AVEs do not measure the value of PR or communication, media content, media achievement, etc. (AMEC-International Association for Measurement and Evaluation of Communication, 2010, 2015, 2020).

Macnamara (2011) exposes the fundamental practical and ethical flaws in using equivalents to advertising value, namely:

- Editorial advertising can be negative. Clearly, it is spurious to compare negative advertising with the best creative advertising. Yet most AVE calculations do just that. Few advocates of this method take the time-consuming trouble of deducing negative articles and negative paragraphs or sections within articles;

- Editorial content can be neutral. Even this type of content cannot be validly compared with advertising because advertising is never neutral;
- Editorial articles usually contain coverage of competitors, including favorable references or comparisons to competitors. Advertising never compares competitors favorably, and most advertising avoids any mention of competitors;
- Editorial coverage may be poorly positioned, which affects its impact. Advertising is almost always prominently positioned, often with prominent placement;
- Editorial coverage may appear in media that is irrelevant or not part of the target - that is, media that does not reach target audiences and key markets, or media with low circulation and strategically less important. Advertising is strategically placed only in the most important media;
- Editorial coverage may be poorly presented - e.g., with ambiguous headlines, the client's name lost in the story, and even errors. Advertising is prepared by creative professionals for maximum impact using eye-catching visuals and sophisticated design.

It is troubling that despite extensive research illustrating the fundamental practical and ethical flaws in AVEs, and unanimous condemnation from academics and practitioners, public relations professionals continue to use AVEs to supposedly measure the value of their work. In 2005, several leading multinational public relations consultancies were actively promoting AVE numbers to their clients and claiming the value of their work based on AVEs.

Although extensive research and widespread criticism have highlighted the flaws in using AVE as a metric, many communication professionals still rely on it to measure and report their initiatives. This thesis proposes the adoption of a new, objective metric for assessing media coverage. This new metric aims to provide a more accurate and reliable standard for communication professionals to evaluate their work outputs.

2.9. Conclusion of Chapter II

This chapter delved into the complex landscape of media effects and their evolution, starting from early direct influence theories to the nuanced roles media play in shaping

public perception and behavior. By outlining key theoretical frameworks such as the agenda-setting theory and exploring models like the one-step and two-step flow models, the chapter highlighted the significant influence media exerts on public opinion. The role of opinion leaders and influencers, particularly in the digital age, was underscored as critical in filtering and interpreting media content, further shaping public discourse.

The review also examined the profound impact of media coverage on corporate reputation, illustrating how media portrayal and corporate actions are interlinked. The strategic importance of media coverage for brands was discussed, emphasizing its implications on firm performance and valuation. The chapter evaluated various methodologies and metrics used to assess media coverage, critiquing traditional approaches such as Advertising Value Equivalents (AVE) and advocating for more comprehensive and objective metrics.

Ultimately, this literature review sets a foundation for understanding the critical need for brands to measure media coverage effectively, aligning their communication strategies with these insights. This sets the stage for the subsequent chapters, which will delve deeper into the methodologies for evaluating media influence and its implications on corporate reputation.

Chapter III – Methodology

This chapter outlines the methodological framework employed in this doctoral research, which aims to develop a new metric for evaluating digital media coverage of brands. The study is guided to answer the research questions: “Can the output performance of digital media coverage of brands be measured with one metric that combines brand objectives, media targeting, visibility, favorability, readership, and social amplification?” and “Can we establish a correlation between the Media Output Score and Reputation Score of brands?” To address the first question, the research adopts a design science approach, constructing an artifact designed to measure media coverage at the output level, and for the second question comparing the media output score achieved by the brands analyzed in the study with the reputation score achieved in the same period.

The algorithm was used to evaluate the media coverage of brands in a given period of time, determining their performance, and interpreting these results with the events recorded in that period in order to extract insights from their reading and interpretation.

By integrating quantitative measurements with qualitative insights, the research aims to produce a comprehensive metric that can effectively measure the output performance of digital media coverage of brands.

3.1. Research design

3.1.1 Purpose and Mean

The investigation is applied in nature, focusing on the practical application of a new metric for measuring digital media coverage of brands. The goal is to create and apply a metric that practitioners in the field of digital marketing and brand management can use to assess and evaluate and optimize their media strategies.

The study adopts an experimental approach to explore the phenomena under investigation. An experimental approach, as defined by Campbell & Stanley (1963), involves manipulating one or more independent variables to observe their effects on dependent variables within a controlled environment. This allows researchers to infer causality by controlling for confounding variables, leading to more robust conclusions

about the relationships between variables. The use of random assignment and control groups strengthens the internal validity of experiments, ensuring that any observed effects on the dependent variables are due to changes in the independent variables, rather than external factors. Shadish et al. (2002) further emphasize that experimental approaches offer the most rigorous means of establishing causality by allowing for a precise examination of how variables interact under controlled conditions, minimizing potential biases. Given that the goal of this study is to evaluate the effectiveness of the new metric under different conditions, the experimental approach is particularly suitable, as it allows for the control and manipulation of key variables. By creating controlled scenarios in which independent variables, such as different media types or exposure levels, can be systematically varied, the experimental design enables a more precise assessment of the metric's reliability and applicability across different contexts. This approach aligns with the recommendations of methodological scholars such as Babbie (2013) and Creswell (2014), who argue that experimental methods are essential for establishing the robustness of tools and metrics in applied research. By systematically testing the metric under various controlled conditions, the study can generate clear evidence of its performance, providing both practical insights and theoretical contributions.

We adopted the Design Science Research (DSR) methodology to design the Media Output Score (MOS) algorithm. Design Science Research is a rigorous methodological approach used to develop artifacts aimed at addressing real-world problems, while simultaneously contributing to scientific knowledge (Dresch et al., 2014). DSR is distinguished by its dual focus: not only solving a specific problem but also advancing theory, often by creating innovative tools, methods, or frameworks that bridge the gap between practical application and academic research. It aligns closely with the vision of Simon (1969), who saw design as a process of transforming an existing state into a desired one, emphasizing the importance of purposeful creation in problem-solving disciplines. DSR begins with the identification of a relevant, complex problem that requires a novel solution. The problem is not only of practical concern but also presents opportunities for theoretical exploration and innovation. (Hevner et al., 2004) argue that the problem must be well-defined, serving as the foundation for developing the artifact. The design and creation of the artifact is central to DSR. This artifact, whether it is a framework, a process, or a system, must be tailored to solve the identified problem and

is informed by both the existing body of knowledge and creative design principles. (March & Smith, 1995) emphasize that the creation of artifacts in DSR is an essential part of advancing knowledge, as the process of design can lead to the discovery of new insights and perspectives. Once the artifact is developed, it undergoes rigorous testing and evaluation to ensure it effectively addresses the problem. Hevner et al. (2004) highlight that this phase of evaluation is critical in validating the artifact's utility and impact, using both qualitative and quantitative methods. Evaluation can take many forms, from controlled experiments to real-world case studies, depending on the nature of the artifact and the problem context. The evaluation process is not static but iterative; based on the findings from each round of testing, the artifact is refined and improved. Peffers et al. (2007) describe this iterative cycle as essential to DSR, allowing for continuous refinement and adaptation of the solution in response to real-world feedback and new theoretical insights. A key aspect of DSR is that the practical solutions developed must also contribute to scientific knowledge. Gregor & Hevner (2013) stress the importance of this dual focus, ensuring that the artifacts not only solve the problem but also advance the theoretical understanding of the field. This may involve refining existing theories or developing new ones that arise from the design process. For example, a new framework for media coverage evaluation might not only provide immediate value to practitioners but also open new avenues for research in communication studies. DSR achieves this balance by integrating relevance, the creation of solutions that are directly applicable to practice and rigor, the application of scientifically sound methods to ensure validity and reliability.

In this project, the DSR methodology was applied through a structured process of design, implementation, and evaluation, allowing for continuous improvement of the developed solution. The problem identified was the lack of a consensual, scientifically grounded metric for communication professionals to measure brand media coverage. This problem was contextualized through a thorough literature review, building on existing research, including (Deephouse, 2000) definition of media reputation as the global evaluation of a company by the media. From this foundation, we developed a set of design requirements for a new algorithm. These requirements were informed by both the identified problem and the research insights gleaned from the literature review. The next step involved developing a prototype metric—an artifact created through iterative refinement. The metric was designed based on theoretical frameworks and industry

standards, and initial versions were tested using pilot data from media coverage of telecommunications companies in Portugal. This real-world application allowed for the evaluation of the metric's accuracy, reliability, and usability. The evaluation process involved both quantitative analysis, such as regression testing to integrate different components of media coverage into a unified metric, and qualitative contextualization with facts and case studies. This rigorous testing phase ensured that the metric was not only empirically valid but also practically relevant, in line with the principles of DSR (Keller et al., 2010). Finally, we evaluated the effectiveness of the developed metric by analyzing media coverage results for telecommunications companies, comparing the output scores with reputation scores to validate consistency. This approach highlights the iterative and cyclical nature of DSR, where each phase of the process—problem identification, artifact creation, evaluation, and refinement—builds on the previous one to create an innovative and scientifically grounded solution. The artifact, a composite metric for media coverage, was developed and tested using real-world data, demonstrating how DSR facilitates innovation while ensuring theoretical advancement.

3.1.2 Data Collection

The study relies on primary data collected through observations and interactions with digital media coverage. Data sources include news articles published in digital media, targeting criteria, visibility metrics, favorability based on content analysis, readership statistics, and social amplification measures. This comprehensive data collection approach ensures that all relevant aspects of media coverage are captured.

To demonstrate the Media Score metric with a practical case, we used a dataset with all the news broadcasted on Portuguese websites with reference to the brands Altice/MEO, NOS, and Vodafone (the largest operators in the Telecommunications market in Portugal).

The selection of news items considered an editorial criterion of relevance to the brands and the sector of activity in question, excluding circumstantial references to the brands and naming sponsors that had no direct link to the brands' business. The brands involved sponsor various musical and sporting events, and in this context references to brands in the exclusive context of these events were excluded. At music events where the brands give their name to the events, such as NOS Alive, Vodafone Paredes de Coura and Meo

Marés Vivas, news that referred to the brands in the context of the event, referring to the musicians' participation in these events, or other news about the event without contextualizing the brand's direct involvement were not included in the dataset.

The Altice and Meo brands were considered as a single brand for the purposes of validating the new metrics and case studies. This means that the object of the analysis was understood as a single brand. This decision is due to the fact that the media uses both brands arbitrarily, referring to both or just one depending on the context. This is related to the fact that Altice owns the Meo brand and operates in the market with both brands, with Altice often associated with the institutional component and Meo with the commercial and product component.

When comparing the brands media output scores with the brand reputation scores indices, since the reputation scores are segmented by the two brands, in this specific case the respective Media Output Scores of the two brands were broken down. This view should only be applied in this specific case, as it is not clear when journalists are referring to one or the other brand specifically. As far as reputation as perceived by public opinion is concerned, this question was not asked as the intention was not to study the perception of the relationship between the two brands.

The target geographic scope of the study, considering the telecommunications industry, was defined as the Portuguese population over 14 years of age, in a total universe of 8988124 individuals.

The brand's communication goals were defined as contact with the target population, and weights were assigned to the media, considering their ability to influence the target population, particularly regarding decision makers for the choice of the telecom operator in Portugal.

The importance of media outlets for brands and industries stems from factors such as audience targeting, credibility, influence, and platform reach. Different outlets attract distinct audiences, making it crucial for brands to align with media that resonate with their target market. Dahlen et al. (2010) showed that advertising in contextually relevant outlets leads to greater engagement and purchase intent. Credibility also plays a critical role, as trusted outlets like *The New York Times* or *The Economist* positively influence brand perception (Hwang & Cameron, 2014). Furthermore, media outlets have agenda-setting power, shaping public opinion and industry discourse, as demonstrated

by (Kim & McCombs, 2007), making major outlets like *CNN* or *Forbes* key platforms for brand visibility. Specialized media also provide essential channels for industry-specific brands. Keller et al. (2010) highlighted that brands advertising in niche media, such as *Wired* for tech companies, benefit from higher brand recall and engagement due to audience relevance. Additionally, media outlets act as cultural intermediaries, shaping societal trends. Bourdieu (1987) emphasized that brands featured in outlets with cultural cachet, like *Vice* or *Rolling Stone*, gain cultural capital and prestige.

The weights assigned to the media outlets in this research were meticulously developed by a media analyst from Cision with over 20 years of experience in media analysis. This expert has specialized in the telecommunications industry, working specifically on assessing the impact of media on consumer decision-making in this sector. Using standardized methods outlined by industry associations, the analyst brings a deep understanding of the telecommunications market and the Portuguese media landscape. Their vast experience in analyzing media influence in the telecommunications sector ensures that the media weights used in this study are highly credible and reflect the realities of this market. This expertise lends significant validity to the selection of media outlets and the corresponding weights applied to each in this study.

In summary, the significance of media outlets varies by how well they align with industry goals, credibility, and audience reach. By selecting the right outlets, and using expert media weighting, brands can improve engagement, trust, and visibility in their markets.

3.1.3 Approach

The mixed methods approach, which combines qualitative and quantitative research techniques (Creswell, 2014), has been effectively utilized in communication studies by scholars such as Lawrence A. Wenner, Patricia Riley, and Christine Hine. Wenner's exploration of media and sports communication (Wenner, 1989), Riley's studies on organizational communication (Riley, 1983), and Hine's research into digital communication (Hine, 2000) all demonstrate how mixed methods provide a comprehensive understanding of complex communication phenomena by integrating the depth of qualitative insights with the statistical rigor of quantitative analysis. This

approach is particularly suited to the study at hand, as it allows for a nuanced examination of both the content and effects of media in the telecommunications industry. The quantitative data provides a measurable foundation for assessing brand visibility and reach, while qualitative analysis adds depth and context, ensuring that the metric is both empirically valid and practically relevant. Quantitative data provides a measurable foundation for assessing brand visibility and reach, while qualitative analysis adds depth and context, ensuring that the metric is both empirically valid and practically relevant. As Creswell (2014) emphasizes, combining quantitative and qualitative methods enhances the validity of research, offering both precision and contextual understanding. Similarly, Hair et al. (2010) argue that while quantitative metrics track brand performance, qualitative insights are essential for interpreting these figures within real-world consumer experiences, making the data actionable and meaningful.

Quantitative data is gathered to quantify the various components of media coverage. This includes numerical data on brand visibility (e.g., impressions, reach), readership (e.g., article views, time spent), and social amplification (e.g., shares, likes, comments). The application of statistical techniques, such as regression analysis, enables the integration of various media coverage components into a single metric, aligning with best practices for media performance measurement. This approach is consistent with the frameworks outlined by scholars like Keller et al., (2010), who emphasizes the importance of quantitatively measuring brand equity through integrated metrics, and (Luo & Donthu, 2006), who highlight how statistical models like regression analysis are used to assess media effects on consumer behavior and brand performance. Furthermore, Philips et al. (2014) suggest that combining media data into a unified metric allows for a more accurate and actionable understanding of media's impact on brand visibility and consumer engagement.

Qualitative data is collected to understand the context and nuances of digital media coverage. This includes content analysis of media articles to determine the favorability per article and contextualization of the brand performance with the theme, topics and current events of that period for these brands. Qualitative insights help in understanding the subjective aspects of media performance and in refining the metric to ensure it aligns with industry practices and expectations.

Content analysis is the systematic, objective and quantitative analysis of message characteristics (Neuendorf, 2017). It is one of the fundamental methods used in the study of agenda-setting, since media agendas can be perceived through this type of analysis (Mcquail & Windahl, 1993). Media content analysis is a specialized application of content analysis. (Macnamara, 2011) Neuendorf (2017) describes content analysis as the primary message-centered methodology and cites studies by Riffe & Freitag (1997) and Yale & Gilly (1988) who reported that in the field of mass communication research, content analysis has been the fastest growing technique over the past 20 years or more' (Neuendorf, 2017). Media content analysis was introduced as a systematic method for studying the mass media by Lasswell (1938), initially to study advertising. From a detailed analysis of news content, media analysts can produce descriptive information about the main issues reported, the main sources quoted, the main messages communicated to the public and so on (Mcnamara, 2011). Neuendorf (2017) says that media analysis is useful for 'facilitating' inference and, in addition, has predictive capabilities for identifying likely effects on public opinion, as well as other specialized uses. Neuendorf lists four main approaches and functions of content analysis: descriptive, inferential, psychometric and predictive.

All the studies consulted and listed above on media coverage of corporations used content analysis to obtain quantitative descriptions of the news and used this quantitative data to calculate the variables used to evaluate media coverage. Although most of them used the human coding method in the content analysis process (Deephouse, 1997, 2000; Einwiller et al., 2010; Fombrun & Shanley, 1990; Kioussis et al., 2007; Lee & Carroll, 2011; Meijer & Kleinnijenhuis, 2006), some also used computer-aided text analysis program as DIRECTION, to perform the content analysis. (Carroll, 2004, 2009)

The rapid advancement of large language models like ChatGPT has sparked a surge of research interest in their potential applications and implications (Liu et al., 2023). ChatGPT, developed by OpenAI, has demonstrated remarkable capabilities in natural language processing, generating human-like responses that are often indistinguishable from those produced by humans. ChatGPT's impressive performance can be attributed to its underlying architecture, which leverages the power of transformer-based language models trained on massive datasets (Apostolopoulos et al., 2023). This model's ability to understand and generate natural language has led to its widespread adoption in a variety

of domains, including text generation, translation, and data analysis (Hariri, 2024). Recent studies have highlighted the remarkable versatility of ChatGPT, showcasing its ability to excel in a diverse array of applications, from healthcare and education to research and business (Apostolopoulos et al., 2023; Gill & Kaur, 2023; Hariri, 2024; Shahriar & Hayawi, 2023). The system's capacity to understand natural language, generate coherent and contextually appropriate responses, and adapt to different scenarios has been a key driver of its growing popularity, with over 600 million users reported (Apostolopoulos et al., 2023). One of the primary areas of interest in the use of ChatGPT is its potential for content analysis, particularly in the realm of sentiment, themes, and topic extraction. ChatGPT's natural language processing capabilities allow it to effectively interpret and analyze textual data, providing valuable insights into the underlying sentiments, thematic elements, and topical focus of a given corpus (Hariri, 2024; Shahriar & Hayawi, 2023). By leveraging ChatGPT's language understanding and generation capabilities, researchers and practitioners can gain a deeper understanding of the emotional, conceptual, and topical nuances embedded within textual data, whether it be social media posts, academic papers, or business reports (Gill & Kaur, 2023; Hariri, 2024; Shahriar & Hayawi, 2023). However, like any powerful technology, the use of Natural Language Processing (NLP) for content analysis—which combines computational linguistics, machine learning, and deep learning models to process human language—raises significant ethical concerns that must be carefully addressed. These concerns include issues such as bias, privacy, data security, and the potential perpetuation of harmful language patterns, which require comprehensive frameworks and guidelines for mitigation and are directly influenced by the specific model used (Apostolopoulos et al., 2023; Hariri, 2024; Shahriar & Hayawi, 2023). Despite these limitations, the potential benefits of using ChatGPT for content analysis are substantial. By leveraging its natural language processing capabilities, researchers and analysts can streamline the process of extracting meaningful insights from large datasets, enabling more efficient and comprehensive understanding of the underlying sentiments, themes, and topics (Gill & Kaur, 2023).

Since this study aims to develop an algorithm to automatically evaluate the media coverage of brands, the content analysis will be processed by ChatGPT Model GPT-4, namely, to determine brands media favorability and map themes and topics of the news articles.

Using the text of all the articles collected for this study as input, a Python script (Image 8) was developed to use the ChatGPT-4 API to determine the favorability of each news item.

Image 8

Python script used to get favorability from the articles text.

```
import openai
import pandas as pd

openai.api_key = 'xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx'

filename = 'TELCO-DATASET-FINAL.xlsx'

def get_favorability(text, brand):
    prompt = f"Please analyse the text and categorize the favorability for the brand '{brand}' "
    "as Very favorable when the text strongly enhances the brand's reputation, indicating significant "
    "positive outcomes such as industry recognition, awards, or exceptional customer satisfaction; "
    "Favorable when the text positively impacts the brand's reputation, mentioning favorable outcomes "
    "like positive customer feedback or minor industry recognition; Neutral or Balanced when the text "
    "has a neutral impact, neither enhancing nor harming the brand's reputation, it might include factual "
    "information without any positive or negative connotations; Unfavorable when The text has a mildly "
    "negative impact on the brand's reputation, possibly suggesting minor issues, criticisms, or concerns; "
    "Very unfavorable when the text severely damages the brand's reputation, indicating serious negative "
    "outcomes such as involvement in corruption, legal proceedings, or significant customer dissatisfaction."
    "Consider the tone, word choice, and the overall context of the text when making your assessment. "
    "Here's the text: '{text}'"
    response = openai.chat.completions.create(
        model="gpt-4",
        messages=[{"role": "user", "content": prompt}],
        temperature=0.2 # Lower temperature for more deterministic output
    )
    favorability = response.choices[0].message.content.strip()
    return favorability

df = pd.read_excel(filename, sheet_name='my-dataset')

# Ensure the Excel file has columns named 'text' and 'brand'
if 'text' not in df.columns or 'brand' not in df.columns:
    raise ValueError("The input Excel file must contain columns named 'text' and 'brand'")

df['favorability'] = df.apply(lambda row: get_favorability(row['text'], row['brand']), axis=1)

with pd.ExcelWriter(filename, engine='openpyxl', mode='a') as writer:
    df.to_excel(writer, index=False, sheet_name='Favorability Analysis')

print("Favorability completed and written back to", filename)
```

Code explanation: The code imports the necessary libraries (openai and pandas), sets the OpenAI API key, defines functions for sentiment, topic, and theme analysis, reads an Excel sheet, applies the analysis functions to create new columns for the results, and writes the updated data back to the Excel file.

In the first calls to the ChatGPT, the model had trouble differentiating between very favorable and favorable, as well as between very negative and negative. This led to the need to develop the prompt to clarify the distinction and show clear examples so that the model could be improved.

After testing a few dozen combinations for the prompt, the best results were achieved with the following prompt:

“Please analyze the text and categorize the favorability for the brand '{brand}' as Very favorable when the text strongly enhances the brand's reputation, indicating significant positive outcomes such as industry recognition, awards, or exceptional customer satisfaction; Favorable when the text positively impacts the brand's reputation, mentioning favorable outcomes like positive customer feedback or minor industry recognition; Neutral or Balanced when the text has a neutral impact, neither enhancing nor harming the brand's reputation, it might include factual information without any positive or negative connotations; Unfavorable when The text has a mildly negative impact on the brand's reputation, possibly suggesting minor issues, criticisms, or concerns; Very unfavorable when the text severely damages the brand's reputation, indicating serious negative outcomes such as involvement in corruption, legal proceedings, or significant customer dissatisfaction. Consider the tone, word choice, and the overall context of the text when making your assessment. Here's the text: '{text}'”

The favorability analysis performed by ChatGPT on the dataset was systematically reviewed, following a structured, objective approach to ensure reliability and minimize bias. This process adhered to established methodologies in natural language processing and favorability analysis, incorporating practices such as clear evaluation metrics, blind reviews, and contextual assessments. Evaluation metrics, including precision, recall, and F1 scores, were central to assessing ChatGPT's performance in categorizing favorability. These metrics are widely used in machine learning and are essential for determining the accuracy of the model in identifying and categorizing favorability (Sokolova & Lapalme, 2009). Precision measures how often the model's classification of positive or negative favorability was correct, while recall assesses its ability to capture all relevant favorability instances. The F1 score balances precision and recall to offer a more comprehensive measure of the model's performance (Manning et al., 2008). To reduce bias in this evaluation, a blind review was conducted, meaning the articles' favorability was evaluated without prior knowledge of ChatGPT's classifications. This ensured that the human evaluation was objective and not influenced by the model's initial output (Bornmann et al., 2010). This method allowed for a more accurate comparison between human judgment and the model's classifications. Contextual assessments were also vital in this review. Given that favorability analysis models can struggle with subtleties such as sarcasm, irony, or culturally specific

nuances (Pang & Lee, 2008), the human review focused on how well ChatGPT recognized these factors. Special attention was given to texts where superficially favorable language masked an underlying unfavorable tone. These assessments allowed for a more detailed understanding of the model's performance in handling complex linguistic expressions of favorability. The findings from this comprehensive review indicated that ChatGPT performed well in identifying broad positive or negative favorability but had difficulty distinguishing between more nuanced categories, such as very favorable versus favorable, or very unfavorable versus unfavorable. Additionally, the model struggled with texts that contained mixed favorability, with both positive and negative arguments. In these cases, ChatGPT tended to overemphasize one sentiment, leading to an unbalanced classification that did not fully capture the complexity of the text. This structured approach, which combined evaluation metrics, blind reviews, and contextual assessments, provided a thorough and unbiased evaluation of ChatGPT's ability to classify favorability. The results underscore both the model's strengths and areas where further refinement is needed, particularly in recognizing nuanced favorability and handling mixed arguments. These insights are consistent with best practices in AI and natural language processing research (Manning et al., 2008; Pang & Lee, 2008; Sokolova & Lapalme, 2009). The final favorability sentiment classification assigned automatically was revised manually for all articles. Although the manual review of all articles contained in the dataset took a long time, it proved to be very important for understanding deviations and better training the model. The manual review served to ensure the reliability of the classification process. While this does not involve direct retraining of the GPT-4 model, it plays a critical role in refining outputs and identifying deviations. Manual verification, as noted by Dodge et al. (2020) and Geva et al. (2021), provides high-quality, human-verified data that helps improve the model's application in future datasets. Such human-in-the-loop approaches are essential for pinpointing gaps in model performance and enhancing its overall accuracy, as highlighted by Bender & Koller (2020).

Still using ChatGPT for content analysis, the model was asked to identify the main themes of each news item and produce a summary of the themes that marked the media coverage, to better fit the results with the events in the case study.

Using the text of all the articles collected for this study as input, we now run the following code in Python (Image 9).

from secondary details. This level of focus was crucial in handling a large dataset of media content, ensuring that only the most relevant themes were captured.

The second prompt was crafted to generate a comprehensive summary that not only synthesized the analyzed content but also provided an overview of how themes were distributed across different brands. This ensured a holistic analysis, offering insights into media trends and brand representation.

Alternative prompts, such as more general summarization requests, were initially considered but found to lack the specificity needed for accurate theme identification and brand-related trend analysis. After reviewing different prompt structures, these were chosen for their efficiency in capturing key themes and providing actionable insights.

This methodologically sound approach ensured both precision and relevance in the media analysis, offering a structured and comprehensive understanding of the media landscape.

Using these prompts, the results proved to be coherent and extremely useful in facilitating the understanding of the metrics within the context of the themes. The extraction of themes from each article was crucial in guiding the analysis of media coverage, as it provided a structured framework for interpreting the broader media context. By identifying the central themes, it became easier to link the media content to specific industry trends, brand narratives, and public sentiment. This thematic analysis was instrumental in uncovering the underlying factors that influenced media attention, helping to contextualize the coverage in a way that pure metrics (such as frequency or reach) alone could not achieve.

The summary prompt added a higher-level perspective by synthesizing the overall media coverage and offering an overview of how themes were distributed across different brands. This summary was critical for understanding the variations in media coverage performance among brands, as it linked the quantitative data (e.g., article volume, audience reach) with qualitative insights derived from the themes. For example, brands that experienced significant fluctuations in coverage could be analyzed not only by the amount of coverage but also by the contextual factors—such as the nature of the themes associated with them—that contributed to these variations.

The favorability analysis provided an important layer of understanding by assessing whether the media coverage was positive, neutral, or negative. By combining the

favorability analysis with the thematic and summary approaches, the study was able to offer a comprehensive view of each brand's media presence. The favorability scores helped contextualize the themes, showing not just what topics were being covered but also how they were framed and perceived by the media and public.

This integrated approach—combining theme extraction, favorability analysis, and summarization—was essential in understanding the drivers behind the variations in media coverage across brands. It ensured that the analysis was not only grounded in data but also contextually informed by both the sentiment and the specific topics that shaped each brand's media presence. By linking the favorability and thematic findings, a more nuanced interpretation of media performance emerged, providing actionable insights into both the volume and the tone of media coverage.

To demonstrate the validity of the algorithm developed, all the news broadcast during the period between January 1, 2021, and December 31, 2023, about the three main Portuguese telecommunications brands was automatically analyzed using the Media Output Score metric and compared with the corporate reputation attributed by RepScore in 2021, 2022 and 2023 to these same companies.

The combination of quantitative and qualitative approaches that underpin the construction of the media coverage assessment artifact meets the objectives of this research, which is to measure the media coverage of brands near real time. If, on the one hand, it is quantitatively possible to understand the media pressure on brands, taking into account their ability to generate recent news, on the other hand, it is qualitatively possible to determine whether this news is being capitalized on in a positive or negative way for their reputation.

Finally, by cross-referencing the results obtained from the application of the measurement algorithm with the reputation indices of each of the brands will allow us to understand if there exists a linearity between both. To verify if a correlation between the Media Output Score and Reputation Score of brands could be established, the present study uses RepScore data to obtain the corporate reputation ratings of the companies analyzed in the period under study compared with the new media coverage evaluation metric proposed. The RepScore™ study has been carried out by the company OnStrategy since 2009 and assesses the positioning and emotional and rational levels of reputation associated with more than 2000 brands in Portugal. This study is carried out continuously throughout the year and in accordance with the certification of the

ISO20671 (strategy and strength assessment) and ISO10668 (financial assessment), evaluating the attributes associated with notoriety, relevance, consideration, trust, admiration, preference and recommendation. The 2022 survey is based on fieldwork that takes place continuously over the 52 weeks of the year, with more than 40,000 citizens online, and more than 10000 citizens in person or on the phone representative of Portuguese society in terms of geographical distribution, gender, age and level of education. The methodology is based on a qualitative approach to Brand Positioning, identifying all spontaneously mentioned values and attributes, and a quantitative approach to Brand Reputation. It examines brand awareness, emotional reputation (relevance, consideration, trust, admiration, preference, recommendation), rational reputation (products and services, innovation and differentiation, work environment and well-being, social responsibility, governance and ethics, leadership and vision, business and financial performance), and the behaviors resulting from reputational perception. The overall brand reputation performance is evaluated using a scale of 100 points (Repscore, 2021).

Combining a review of recent studies on media reputation with quantitative and qualitative media analysis using the newly developed artifact algorithm, and cross-referencing with each brand's reputation indices, offers a comprehensive perspective. This approach integrates the latest research on media reputation with a new measurement algorithm that incorporates best practices for evaluating media reputation.

The artifact for evaluating media coverage proposed by this research guarantees an approach that is consistent with recent research and at the same time prompts new testing exercises with new data sources to demonstrate the elasticity of the algorithm developed to evaluate different scenarios across various sectors of activity.

This approach allows for a holistic understanding of the evaluation of brands' media coverage, capturing both established theories and emerging practices and trends for analyzing media reputation and its interdependence with corporate reputation.

The creation of a technological artifact for digital media analysis introduces a new dimension to research methodology, in that in addition to improving accuracy and objectivity in data collection, it allows us to explore aspects that would be difficult to capture through traditional methods, namely the ability to analyze large volumes of data near real time, offering faster and more reliable data that would be possible to analyze manually and considerably lowering this cost.

The ability to extract insights, create alerts, identify crises or opportunities and continuously align the communication strategy based on the systematic, near real-time evaluation of results that only automation allows is undoubtedly a decisive factor for the industry, which is faced with a 24/7 calendar with an obligation to respond quickly, sustainably and in line with events.

3.2. Media Output Score (MOS) - the artifact for measuring media coverage

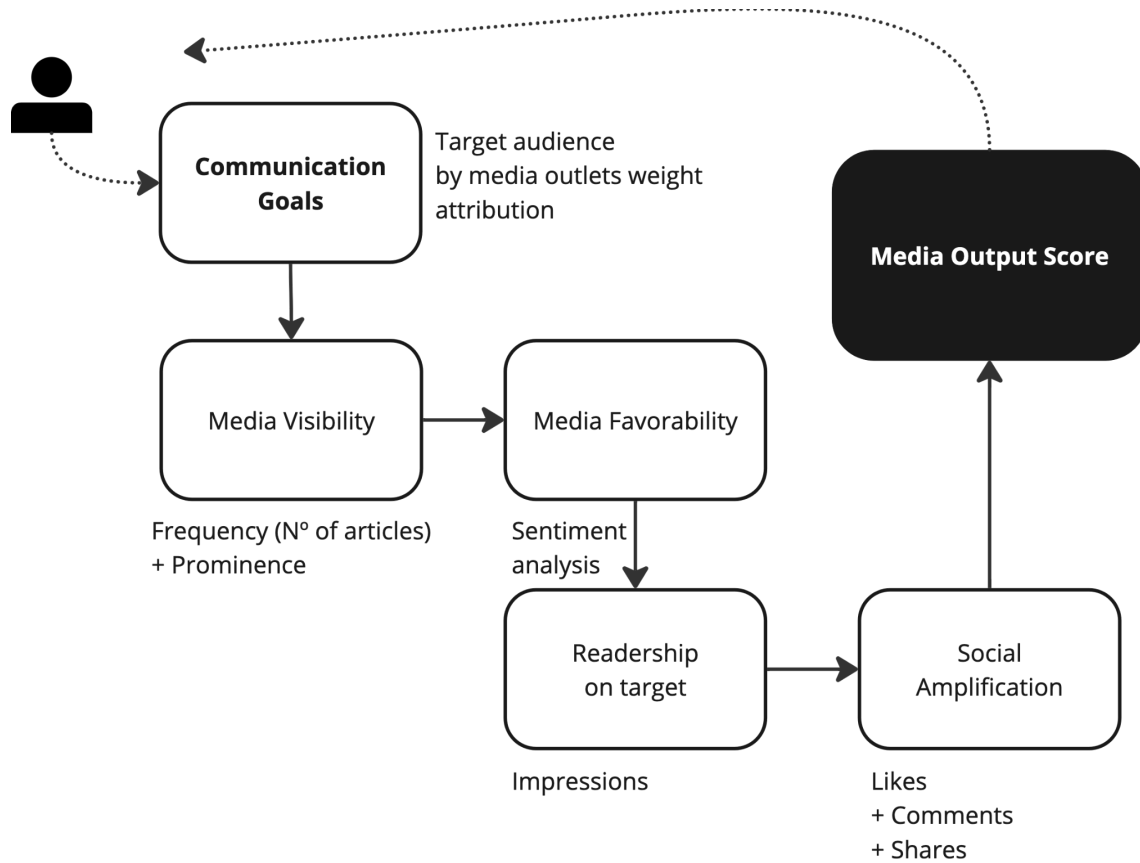
The development of the Media Output Score (MOS) was directly informed by the extensive literature review presented in Chapter II. In that chapter, we explored in detail the key theories and metrics for evaluating media reputation. Drawing from this body of theoretical knowledge, the most relevant and applicable metrics were selected and adapted to fit the digital context and the communication needs of contemporary practices, leading to the conception of the MOS.

MOS, the artifact for measuring media coverage, is a measurement algorithm that integrates metrics such as media visibility, media favorability, readership and social amplification, drawing on methodologies established by Deephouse (2000), Pollock & Rindova (2003), Kioussis (2004), Bowen et al. (2005), Distaso (2007), Carroll (2004, 2009), Meijer & Kleinnijenhuis (2006), Zyglidopoulos & Georgiadis (2006), Purcell et al. (2010), Tenenboim & Cohen (2015), Zhang (2014, 2016) and Robertson et al., (2023).

Conjugating the objectives to media outlets tiers classification with media visibility, media favorability, readership, and social engagement (Image 10), MOS will be attributed linearly to each news item, ensuring that individual events are evaluated based on their immediate impact, and cumulatively to a set of news items, to capture the broader influence of sustained media coverage over time, being the metric that will be the basis of the media coverage measurement that this work intends to present.

Image 10

The Media Output Score foundation diagram



Depending on each brand or organization's strategy, the professional must define its communication objectives. All modern communication evaluation models, such as the evaluation model developed and used by the European Commission Directorate-General for Communication (European Commission, 2015), the UK Government Communication Service Evaluation Framework (UK Government Communication Service, 2015) or the AMEC Integrated Evaluation Framework (AMEC-International Association for Measurement and Evaluation of Communication, 2016) are based on an initial definition of the communication objectives. The objectives should be defined according to the scope of the analysis to be performed. The analysis may have as its scope the evaluation of the brand's annual communication plan, of the launch of a certain product, of a communication initiative, of a crisis, etc. The maximum point to reach will thus be defined considering the communication objectives and since it is a media coverage evaluation, it should focus on a prior classification of the relevance of

each media outlet for the brand strategy, considering its influence, reach and relevance to communicate the message intended by the brand. The relevance of each media outlet varies depending on the target of the communication. Considering the brand's communication objectives, communication professionals must pre-classify the relevance that each media outlet will have for the brand based on a detailed knowledge of its target audiences in conjunction with the target audiences that the brand proposes to reach. This way, the weight of each media outlet determined by each potential reach will be resized through a percentage allocation previously determined by the communication professional, who will establish which part of the potential audience of each media outlet should be considered as a measurement variable for the readership calculation.

Media visibility is assessed through attention and prominence. Attention is measured by the frequency of stories about each brand, while prominence is evaluated on a per-article basis using the same scale used by Bowen et al. (2005) and DiStaso (2007):

- A prominence score of three is assigned if the subject appears in the title
- A score of two is given if the subject appears in the first paragraph.
- A score of one is assigned if the subject appears only in other sections of the text.

The media favorability index will be based on the measure developed by (Meijer & Kleinnijenhuis, 2006) improved with the conclusions from Robertson et al. (2023) about the weight of negative news compared with positive news. Based on Robertson et al (2023) conclusions, and to capture the increase in potential audience for negative news and decrease for positive news, the following correction was made to the scale initially proposed by Meijer and Kleinnijenhuis: +0.98, +0.48, 0, -0.53, and -1.04, when the news was positive, partially positive, neutral, or balanced, partially negative, or negative. To determine the favorability of each news item we used ChatGPT, Model 4o. The decision to utilize ChatGPT for processing content analysis is grounded in its ability to efficiently manage and analyze large volumes of textual data, particularly in the context of media analysis. Large Language Models (LLMs), like ChatGPT, offer substantial advantages in identifying patterns, themes, and sentiments across vast datasets, making them an ideal tool for handling the scale of content needed in this research. By employing ChatGPT, the analysis process was significantly streamlined,

ensuring efficiency and comprehensive coverage of the media content. However, it is important to acknowledge the limitations of LLMs in tasks such as sentiment analysis. While ChatGPT performs well in identifying broad sentiment categories—such as positive, negative, or neutral—it can face challenges in detecting subtleties like sarcasm, irony, or the distinction between varying degrees of sentiment (e.g., differentiating between positive and very positive, or negative and very negative). To mitigate these limitations and improve the accuracy of the model's output, we undertook an exhaustive process of prompt optimization. To enhance ChatGPT's ability to accurately differentiate between varying levels of sentiment, we provided examples directly in the prompts to guide the model's response. For instance, examples of what constitutes "very positive" versus "positive" sentiment, or "very negative" versus "negative", were explicitly included to help the model understand these nuanced distinctions. This approach ensured more granular and accurate sentiment classification. Furthermore, the research involved an extensive trial and verification phase, during which different prompts were tested, alongside variations in temperature settings—the temperature being a parameter that controls the randomness of the model's responses. By adjusting the temperature, we were able to strike the right balance between creativity and consistency, ensuring that ChatGPT delivered responses that were not only relevant but also aligned with the subtleties required for sentiment differentiation. Multiple iterations of these tests were performed to identify the optimal prompt structure and temperature setting, providing the model with as much guidance and examples as possible to improve its accuracy in sentiment classification. To further safeguard the quality of the analysis, the outputs generated by ChatGPT were subjected to a thorough human review across the entire dataset. After the initial classifications by ChatGPT, each result was meticulously verified by a human evaluator, particularly focusing on cases where the sentiment was more complex or nuanced. This human-in-the-loop approach ensured that any misclassifications or ambiguities were corrected, maintaining the highest level of accuracy in the final analysis. By combining ChatGPT's strengths in efficiently processing large-scale data with carefully crafted prompts, optimized parameters, and manual oversight, this hybrid methodology ensured a balance between efficiency and precision. The iterative testing process, supported by comprehensive examples and human review, provided a robust framework that minimized the limitations of LLMs and ensured that the analysis met the rigorous standards required for a doctoral thesis. This approach allowed for the creation of a comprehensive and highly accurate content

analysis, combining the scalability of AI with the accuracy and critical insight of human evaluators.

Given the existing limitations to obtain the reach of a particular online news story, a metric that would be extremely relevant to assess its real impact on the audience, we chose to work with the potential reach of each media outlet to determine each published article potential reach. Thus, we used the Similar Web platform, which provides an API that allows us to collect, among other indicators, the number of monthly visits to a given website and the average number of pages visited by each user per visit. Similar Web combines a mix of digital signals obtained from a variety of unique sources allows us to measure and map the digital world in a timely and comprehensive way. It uses data directly measured through first party analytics (e.g., Google Analytics) of millions of websites and apps, publicly available data (e.g., Census data etc.) algorithmically captured and indexed from billions of websites and apps, anonymous traffic data collected from Similar Web products installed on millions of devices, worldwide and Rich data pre-analyzed by global partners like DPSs, ISPs, measurement companies and corporate intelligence firms. (Similar Web, n.d.). To calculate the minimal potential readership of each news item, we combined the average number of visits to the website in a day divided by the total number of news items produced on average in a day by the website and multiplied by the average number of pages visited by each visitor resulting in the following formula shown in image 11.

Image 11

MOS Readership formula

$$Readership = \frac{dv}{da} .pv$$

Where *dv*=Media Outlet daily visits, *da*=Number of articles produced by the media outlet daily, *pv*=number of pages per visit.

Social shares are added to the readership potential, which can result in an inflated final score depending on the level of social engagement achieved. To calculate social engagement, we used the Sharedcount software which provides social amplification metrics for news articles (Sharedcount, n.d.). Sharedcount software allows to obtain

near real time the number of total interactions with a given online news story, adding the engagement within Facebook and Pinterest. We considered the total interaction (Likes, Comments and Shares) registered in Facebook, during seven days after the article publication as the reference metric. We chose Facebook to account for engagement because it is the most widely used social network in Portugal. Data published in Meta's advertising resources indicates that Facebook had 5.90 million users in Portugal in early 2023 (DataReportal, 2023). The metric used to represent social amplification throughout this study is engagement and the unit is the total number of engaged interactions. The total engagement will be used as an oversizing factor multiplied by 10 in the MOS formula.

The methodology employed in this analysis provides valuable insights into media performance, yet it is essential to recognize its inherent limitations. One notable limitation is the reliance on potential versus actual reach metrics. While potential reach estimates the maximum possible audience exposed to a piece of media, it does not account for how many individuals actually engage with or consume the content. This distinction between potential and actual reach raises concerns about the reliability of the metrics when used to assess real-world media impact. Potential reach often inflates audience numbers and can misrepresent the true scope of influence that a piece of content achieves. Another limitation lies in the use of tools such as SimilarWeb, which aggregates digital signals from various sources to provide estimates on web traffic, user engagement, and digital visibility. While SimilarWeb offers valuable data, it relies on a combination of sampling, third-party data, and algorithms that may not always reflect the true picture of digital engagement. These approximations can introduce variability in the accuracy of the metrics, as they may overestimate or underestimate traffic and user behavior depending on how the data is collected and interpreted. Therefore, metrics generated by tools like SimilarWeb may not fully capture the nuances of digital media consumption and could misrepresent the effectiveness of specific campaigns or media exposure. Additionally, the reliance on social engagement data derived solely from Facebook, even though it is the largest social network in Portugal, presents another limitation. Facebook's dominance in the social media landscape provides a broad view of engagement, but it excludes critical insights from other platforms such as Instagram,

Twitter, LinkedIn, or emerging social networks, each of which may represent a significant segment of the audience, particularly among different demographics or industry sectors. This singular focus on Facebook could skew the analysis by ignoring engagement patterns on other platforms, potentially leading to incomplete conclusions about media performance. In sum, while the methodology offers a robust framework for analyzing media performance, these limitations—particularly the discrepancies between potential and actual reach, the potential inaccuracies in digital signals from tools like SimilarWeb and the singular reliance on Facebook for social engagement data—should be considered when interpreting the results. These factors underscore the need for a more diversified and comprehensive approach to media measurement that accounts for cross-platform engagement and the real-world accuracy of digital metrics.

To allow MOS to be compared across multiple geographies and compare the impact on different target audiences according to their demographic reach, we chose to scale the potential number of individuals who read the news story and the social interactions oversizing factor. The sum of readership and social engagement must also be scaled according to the objectives defined for the communication, through the percentage weights previously assigned by the communication professional. So that the MOS can be used and cross-referenced in multiple geographies and compare the impact on different target audiences according to their demographic reach, we chose to dimension the potential number of individuals who read the news considering the dominant target population of the media organization under analysis. Thus, the Potential Readership on target, after being oversized with the Engagement and weighted accordingly the communication goals, is divided by the target population of the country under analysis and multiplied by 100.

Image 12

Media Output Score formula

$$MOS = p \cdot \frac{(r + (e * 10)) \cdot ow}{cp} \cdot f \cdot 100$$

Where *p*=prominence (1,2 or 3), *r*= readership, *e*= engagement, *ow*=media outlet weight, *f*=favorability (+0.98, +0.48, 0, -0.53, and -1,04) and *cp*=target country population.

The article MOS is calculated using the following formula shown in image 12. To calculate the MOS for a group of articles the formula should be multiplied by the number of articles.

Since MOS is an infinite metric, it can be difficult to interpret the results when there are no terms of comparison. When MOS scores are compared between brands, periods, media outlets or even individually on a news story-by-news story basis, it is possible to establish a comparison and understand what is better and/or is worse. However, when it comes to evaluating MOS in isolation, there is a need for an interpretative scale that positions the score achieved qualitatively.

Therefore, considering the communication objectives and the dataset defined for this study, an interpretative table of the MOS results was created.

The assumptions for creating the interpretative table were as follows:

- The target of the communication, which was defined as the Portuguese population over the age of 14.
- Total readership achieved in the target for the three brands and in three years of information analysis.
- Maximum achievable favorability, considering all the information provided, excluding news with neutral favorability.
- Minimum favorability achievable, considering all the information broadcast, excluding neutral favorability news stories

Table 1

MOS interpretative scale

Rating	MOS
Excellent	MOS > 59
Robust	between 30 and 58
Moderate	Between 0 and 29
Vulnerable	Between -1 and -65
Weak	MOS < -66

Taking these assumptions into account, the MOS interpretative scale (Table 1) was designed to compare the performance of each brand in each year.

The scale presented in Table 1 allows for a qualitative assessment of the MOS for each brand and each year, facilitating the interpretation of performance ratings and providing insights into how each score should be understood accordingly with the following ratings:

- Excellent performance, the media coverage was outstanding, characterized by widespread and positive attention across multiple platforms. The brand garnered extensive press, with numerous high-profile media outlets providing in-depth reports, interviews, and features. Social media buzz was significant, with trending hashtags and high engagement rates, including shares, likes, and comments. The coverage not only reached a broad audience but also resonated deeply, resulting in a strong, favorable public perception. The strategic use of various media channels ensured that the message was consistently conveyed and amplified, leading to sustained visibility and impact.
- Robust performance, the media coverage was robust, marked by a consistent and comprehensive presence across a wide range of outlets. The brand was featured in key national and regional publications, ensuring broad exposure. Coverage included a balanced mix of news articles, opinion pieces, interviews, and multimedia content, reaching diverse audience segments. The message was delivered clearly and effectively across both traditional and digital platforms, with sustained engagement and follow-up stories that reinforced the event's significance. The extensive reach and depth of the coverage ensured that the intended narrative was well-supported and maintained momentum over time.
- Moderate performance, the media coverage was moderate, with a respectable presence across a select number of outlets. The brand received attention in key publications, though coverage was more concentrated and less widespread. The reporting was generally positive, but the depth and frequency of coverage were limited. Social media engagement was present but not overwhelming, with a steady flow of interactions that helped maintain visibility. Overall, the coverage achieved its primary goals,

providing a satisfactory level of exposure, though there is potential for greater reach and impact in future efforts. The moderate performance could also represent a balanced mix of both positive and negative reports across a select range of outlets. While some negative coverage emerged, it was effectively countered by strategic communication efforts that generated positive stories and perspectives, showcasing the resilience and adaptability of the message. In these cases, this balanced coverage demonstrated a solid performance in terms of communication, as the positive narratives managed to hold ground against the negative trend, ultimately maintaining a fair and nuanced public perception. The engagement was steady, with key messages resonating well, providing a foundation for future efforts to build upon.

- Vulnerable performance, the media coverage was vulnerable, marked by significant exposure but with a predominance of negative narratives. While the reach was broad and engagement levels were high, the overall effect was unfavorable due to the negative tone of the coverage. Positive messaging struggled to gain traction and was overshadowed by critical reports, leading to a public perception that was largely negative. Despite efforts to steer the narrative, the communication strategy was unable to effectively counter the unfavorable trends, resulting in a media presence that highlighted the vulnerabilities rather than strengths.
- Weak performance, the media coverage was weak, dominated by overwhelming negative reports that significantly overshadowed any positive narratives. The communication strategy failed to effectively address the emerging issues, leading to a communication crisis where the negative coverage spiraled, further damaging public perception. Despite some attempts to counter the unfavorable press, these efforts were largely unsuccessful, resulting in a pervasive negative tone that the communication team struggled to manage. The inability to control the narrative or mitigate the impact of the negative media attention highlighted a severe weakness in the overall media strategy.

In order to meet the study's objective of measuring digital media near real time, the MOS sought to bring together metrics previously demonstrated by academic literature and the industry, adding to the metrics demonstrated in the written press as decisive for

evaluating media reputation, metrics that reflected the characteristic reach of digital media and also added the suitability of the metric to the objective of the communication. So, we started from the work of Zhang (2014), retaining media visibility and media favorability and discarding recency, since the new algorithm aims to evaluate near real time and therefore considers this metric to be the same in all situations.

The decision to exclude recency from the algorithm is grounded in the specific objective of measuring near real-time media performance, where the immediate impact of coverage is the priority. In this context, visibility and favorability become the most critical factors for determining media performance. These metrics offer a clear picture of how much coverage a brand is receiving and the sentiment of that coverage, providing actionable insights for brands that need to respond quickly to evolving media situations. By focusing on these elements, the algorithm is optimized for real-time responsiveness, ensuring that brands can understand their media presence as it happens and make timely decisions. Recency, traditionally used to weight media coverage based on how recent the mentions are, becomes redundant in a near real-time framework where all events are happening within a very short time window. As research by Zhou et al. (2018) suggests, in fast-paced digital ecosystems where news stories and social media reactions unfold rapidly, the immediate impact of visibility and sentiment is far more important than distinguishing between slight variations in the timing of media events. In this context, all coverage is effectively considered recent, and what matters most is how much attention a brand is receiving and whether the tone of that coverage is positive or negative. This focus aligns with the purpose of real-time monitoring systems, where the ability to quickly gauge public perception and respond accordingly is crucial. Concerns about the exclusion of recency typically center on the potential for missing delayed media responses or long-term engagement effects. However, this issue is mitigated by the very nature of near real-time analysis, which prioritizes the current state of media coverage. While delayed engagement may be relevant in long-term analysis, the immediate goal of the algorithm is to provide a snapshot of current media performance. In situations such as product launches, social responsibility initiatives, or crisis management, the ability to understand media performance in the moment is far more valuable than accounting for delayed responses. Any delayed media engagement can be tracked using complementary long-term metrics designed specifically for that purpose, ensuring that both immediate and extended media responses are adequately

captured without overcomplicating the real-time metric. By focusing solely on visibility and favorability, the algorithm remains streamlined and efficient, providing real-time insights that are more relevant to the fast-moving digital landscape. This approach ensures that brands receive the most up-to-date feedback on their media presence, without the need for recency, which holds less significance when measuring media events as they unfold in real time. Moreover, as noted by Tucker & Zhang, (2011), the immediacy of media reactions in the digital age often overrides the importance of how recently an event occurred, since the influence of coverage is often realized almost instantaneously. The exclusion of recency from the algorithm strengthens its ability to capture near real-time media performance, focusing on the elements that matter most—visibility and favorability. This ensures that brands can make informed, timely decisions based on the immediate state of their media coverage, while any potential long-term engagement can be addressed through separate metrics designed for extended analysis. This solution provides a more accurate, efficient, and contextually relevant measure of media performance in fast-paced environments, without compromising the ability to track broader media trends where necessary.

In addition to media visibility, readership was added as an essential multiplier to better capture the influence of different media outlets in line with specific communication goals. This allows the MOS to account for the varying reach of each outlet, ensuring that the message's intended impact is appropriately measured. Furthermore, to ensure the MOS adapts effectively to the digital landscape, we incorporated industry-standard metrics that estimate the engagement and amplification achieved through social networks. These metrics include comments, likes and shares of the news articles which were collected from Facebook, enabling us to measure the impact of each media outlet's social media presence.

Some operators in the industry use the credibility of the source as a metric in the evaluation models. However, in the MOS, the credibility of each media outlet was deliberately excluded from the algorithm as a fixed parameter. This choice was made to provide greater flexibility for communication professionals using the MOS, allowing them to assign credibility to each source based on their specific communication strategies and objectives. By giving professionals the ability to adjust this parameter, the MOS adapts more effectively to diverse contexts and strategic needs.

Below in Table 2 we have an extensive comparison between the metrics used by Zhang (2014) and by some measurement key players of the industry. This comparison highlights the distinctive features of the MOS, particularly in how it incorporates certain metrics, such as readership and social engagement, while offering flexibility for professionals to adjust parameters like source credibility.

Table 2

Comparison between MOS and other media coverage evaluation metrics

Metrics	Zhang	Newswhip	Brandwatch	Traack	Meltwater	MOS
Outlets weight based on target audience	-	-	-	-	-	X
Credibility of the source	-	X	-	X	-	-
Number of articles	X	X	X	X	X	X
Prominence	X	-	-	-	X	X
Sentiment/Tone	X	X	X	X	X	X
Readership impressions	-	X	X	X	X	X
Social amplification	-	-	X	X	-	X

Frequency, measured in terms of the number of news items or mentions of the brand, and tone or sentiment, measured in references, negative, neutral and positive or on other broader scales, are metrics common to all the models studied, which demonstrates a critical need to cross-reference media impact, measured through repetition, with the qualitative content of the information for the brand.

The Media Output Score (MOS) offers significant advantages over traditional media metrics due to its comprehensive integration of communication objectives, social amplification, and a nuanced approach to the weighting of positive and negative articles. These elements make MOS a more effective tool for measuring the true impact of media coverage on brand perception and audience engagement. One of the key strengths of MOS is its alignment with communication goals, which ensures that media measurement is not only quantitative but also strategically relevant. According to Buhmann & Ingenhoff (2015), the alignment of media metrics with organizational communication goals is essential for evaluating how media coverage influences corporate reputation and brand perception. MOS integrates these objectives into its framework, ensuring that media measurement is directly tied to the strategic outcomes

brands aim to achieve, such as increasing credibility, enhancing visibility, or managing public opinion. Beyond measuring the volume of articles or readership, MOS captures qualitative aspects such as sentiment, prominence, and source credibility. These factors are critical for understanding not just how much media coverage a brand receives, but also the quality and relevance of that coverage in advancing key communication goals. By embedding these elements, MOS provides communication professionals with actionable insights, allowing for a nuanced evaluation of whether media coverage effectively supports the brand's broader strategy. In today's media landscape, the real measure of message effectiveness lies not only in the volume of coverage but also in how well that message engages the audience and is amplified across social media platforms. MOS recognizes the significance of social amplification as a key indicator of audience engagement. Lovejoy & Saxton (2012) emphasize the importance of social media engagement in amplifying organizational messages. Social amplification, which includes likes, shares, and comments, represents a direct measure of audience involvement with the content. Unlike traditional metrics that only capture passive exposure, MOS tracks how effectively the message resonates with audiences through social interactions and community engagement. Messages that generate high levels of social interaction are more likely to reach new audiences and influence public discourse. MOS incorporates this dimension, enabling brands to assess not only the reach of their media coverage but also its potential for extended influence through social sharing. This makes it possible to gauge the full impact of media presence, taking into account both traditional media coverage and the dynamic, participatory nature of social media. Additionally, MOS stands out by incorporating differentiated weighting for positive and negative articles, based on the recent findings of Robertson et al. (2023). Their research highlights that the impact of positive and negative media coverage on brand reputation is not equal, with negative articles often having a more significant and lasting effect on public perception. By assigning different weights to positive and negative coverage, MOS provides a more accurate reflection of how different types of media influence brand reputation. This allows communication professionals to better assess the true impact of media sentiment and adjust their strategies accordingly. Incorporating these weighted factors ensures that organizations are not misled by the sheer volume of coverage but can instead focus on the quality and tone of the articles that matter most.

The practical relevance and applicability of MOS in the real world is supported by the extensive research on media reputation measurement, as demonstrated in numerous studies and industry publications. Moreover, its coexistence with other industry measurement algorithms, such as those used by Newswhip and Meltwater, highlights its robustness and adaptability to real-world applications. The flexibility it offers to public relations professionals, allowing them to adjust key parameters like source credibility, further enhances its practical utility. The public relations professionals' need for measurement models capable of translating the results of their work fully justifies the media monitoring software industry's interest in these algorithms, and will certainly raise their interest in this model supported by the literature review and practical application using a real sample of articles to be evaluated using this artifact.

Since it has been scientifically demonstrated that the metrics used to create the algorithm are decisive for media reputation evaluation, the algorithm will be validated, in terms of its consistency, using a linear regression analysis and in terms of its usability, by interpreting the results of its application to a sample of news stories.

The regression analysis models the relationship between the media coverage score (dependent variable) and explanatory variables such as media visibility, readership, and social engagement. These variables were selected based on their prominence in media reputation studies as (Carroll, 2004, 2009; Deephouse, 2000; Pollock & Rindova, 2003; Zhang, 2014). The linear regression approach was chosen due to its ability to measure the strength and direction of the relationships between these variables in a straightforward manner. The regression analysis used in this work describes the associative relationships between the dependent variable (the artifact) and the independent variables, indicating the form and degree to which a set of so-called explanatory variables determine the dependent variable.

The performance results recorded by the algorithm were interpreted in light of key media events that occurred during the period under analysis, such as product launches, financial results announcements, crisis management situations, social responsibility initiatives, and other brand-related activities. These events significantly influenced the favorability and theme distribution of media coverage, as well as their impact on the index. For instance, a new product presentation often led to spikes in positive coverage, highlighting innovation and market presence, while crisis situations triggered more intense scrutiny, affecting both the volume and tone of coverage. Similarly, corporate

social responsibility (CSR) initiatives typically attracted favorable media attention, influencing positive shifts in brand perception and reinforcing brand image in the public eye. By correlating these specific events with the algorithm's analysis of media performance, it was possible to discern how particular types of media coverage—such as those focusing on CSR, financial results, or crises—affected each brand's media index. This contextual understanding of media events provided deeper insights into how and why certain brands experienced fluctuations in their media coverage performance, helping to identify the underlying causes of shifts in favorability and theme distribution across the period under review. Incorporating both the favorability analysis and the thematic analysis further enriched this interpretation. For example, the introduction of a new product might generate a high volume of positive mentions, while a crisis event would likely lead to a surge in negative sentiment. This combined approach offered a comprehensive view of how brands navigated different types of media exposure, with both qualitative and quantitative dimensions informing the final analysis.

3.3 Conclusion of chapter III

This chapter detailed the methodological framework used to develop a new metric for evaluating digital media coverage of brands, termed the Media Output Score. By employing a design science approach, the study aimed to create a comprehensive artifact that integrates both quantitative and qualitative data, including brand visibility, media favorability, readership, and social amplification. The methodology combined data collection from digital media sources with advanced content analysis using the ChatGPT model to determine sentiment and thematic relevance.

Through a mixed-methods approach, the research demonstrated the construction, implementation, and evaluation of the MOS algorithm, providing a robust tool for measuring the media coverage of brands in near real-time. The chapter also explained how the MOS could be correlated with brand reputation scores to validate its effectiveness. This innovative methodology sets the foundation for a holistic understanding of media influence on brand reputation, allowing for a more nuanced and data-driven approach to communication strategy.

Chapter IV – Presentation and discussion of the results

This chapter will outline the new algorithm developed for evaluating digital media coverage. The algorithm's formula will be validated using linear regression, with its dependent variables. Additionally, the results will be contextualized by interpreting current events during the analysis period.

The first case study to use the Media Output Score as a reference metric for the telecommunications sector in Portugal in 2021, 2022 and 2023 will measure the scores of the Altice/MEO, NOS and Vodafone brands, the three largest telecommunications operators in this market.

The second case study is focused on the Portuguese main food retailers brands, Auchan, Continente, Lidl, Mercadona and Pingo Doce during the year of 2023.

The comparison of the brands Media Output Score as a metric for assessing their media reputation with the corporate reputation attributed to these brands will verify whether there was linearity between media reputation and corporate reputation over this period. Finally, this chapter will discuss the results, draw conclusions, and outline the limitations and challenges for future research.

4.1. Validation tests

To validate the accuracy and applicability of the Media Output Score (MOS), a new metric designed to evaluate digital media coverage performance, a series of validation tests were conducted. These tests aimed to address two key research questions: (1) “Can the output performance of digital media coverage of brands be measured with a single metric that combines brand objectives, media targeting, visibility, favorability, readership, and social amplification?” and (2) “Can we establish a correlation between the Media Output Score and the Reputation Score of brands?”

The first question was addressed through a design science approach, which involved constructing the MOS as an artifact intended to measure media coverage at the output level. This metric integrates various aspects of media performance—such as media visibility, media favorability, readership, and social amplification—into a single comprehensive score. The artifact prototype was tested using two use cases:

- Measuring the media performance of the three main Portuguese telecommunication brands, Altice/MEO, NOS and Vodafone, using a dataset of three years of articles published on the top eleven digital media outlets that published more articles about the telecommunications industry in the period between 1st of January 2021 and 31th of December 2023.
- Measuring the media performance of the five main Food Retail Portuguese brands, Auchan, Continente, Lidl, Mercadona and Pingo Doce during the year of 2023 on the top eleven digital media outlets that published more articles about food and retail actor in periodo between 1st of January 2023 and 31th of December 2023.

To ensure the metric's robustness, internal consistency was tested by performing a linear regression analysis between the MOS and its constituent metrics using a dataset of 2070 record taken from the first case study, the telecommunications brands in Portugal. This analysis validated whether the algorithm properly reflects the influence of each individual metric, ensuring the MOS aligns with its design objectives and provides a reliable representation of media performance.

For real-world validation, a longitudinal study was conducted using the two use cases, telecommunications and food retail sectors. This analysis aimed to verify the MOS's effectiveness in capturing media performance trends over time and correlating these trends with significant industry events. By applying the MOS to a real-world dataset, its practicality and relevance as a performance measurement tool were confirmed, demonstrating that it can effectively measure media coverage in industry contexts.

The second research question explored whether the MOS correlates with broader brand outcomes, specifically the Reputation Score of brands. To validate this, the MOS results for the analyzed brands were compared to their Reputation Scores over the same period. This comparison sought to establish whether media performance, as measured by MOS, is a reliable predictor or reflection of brand reputation. A strong correlation between the two metrics would support the validity of MOS as not only a tool for media performance measurement but also a potential indicator of brand perception and reputation.

Through these validation processes—internal consistency testing, longitudinal real-world application, and comparison with Reputation Scores—the MOS has been rigorously assessed for its accuracy, practicality, and potential linkage with brand

reputation. These tests confirm that the MOS provides a comprehensive and reliable measure of media coverage performance, addressing both research questions with empirical evidence.

4.2 Linear regression analysis using the first use case: Telecommunications Sector in Portugal between 2021 and 2023

To support the consistency of the MOS metric, a regression analysis was carried out only on the media coverage seen between 2021 and 2023 for the Altice/Meo, NOS and Vodafone brands. The rationale behind the selection of variables and the use of regression analysis was detailed in Chapter III (Methodology), where media visibility, readership, and social engagement were identified as key explanatory variables influencing media coverage scores, based on previous studies (Carroll, 2004, 2009; Deephouse, 2000; Pollock & Rindova, 2003; Zhang, 2014).

Regression is a technique used to investigate the relationship between variables that arise in problems in the most varied areas of science. Generally speaking, the researcher seeks to assess the influence of an explanatory variable X on the expected value of a response variable usually called Y .

The regression analysis validation will be conducted to validate if the output performance of digital media coverage of brands be measured with one metric that combines, brand objectives, media targeting, visibility, favorability, readership and social amplification.

The regression analysis used in this work describes the associative relationships between the dependent variable (MOS) and one or more independent variables, indicating the form and degree to which a set of so-called explanatory variables determine the dependent variable. The coefficient of determination (R^2) varies between 0 and 1 and measures the proportion of the total variation in the dependent variable (Y) that is due to variation in the independent variables (X_1, X_2, \dots, X_n). Thus, the closer the R^2 value is to one (1), the greater the percentage of a variable's variation explained by the independent variables. The sample used for this study consists of 21070 observations representing all the media articles related to telecommunications brands in Portugal included in the selected dataset. This large sample size is critical for a number of reasons, both from a statistical and analytical perspective. First, the volume of 21070

observations provides a high level of statistical power, which is essential for detecting relationships between the MOS and the individual metrics that constitute it, such as visibility, readership, favorability, and social amplification. Larger sample sizes reduce the likelihood of Type I (false positive) and Type II (false negative) errors, making the findings more robust and less prone to random fluctuations or outliers. As the number of observations increases, the reliability of the estimates improves, and the regression analysis becomes more capable of detecting true relationships between variables. Second, this large dataset is sufficiently representative of the telecommunications sector's media coverage in Portugal, covering a wide range of events, brand activities, and media outlets over a three-year period. By including all available articles, the analysis captures a comprehensive view of the media landscape, ensuring that the MOS is evaluated across diverse contexts. This breadth enhances the generalizability of the findings, making the results applicable to various scenarios within the sector. Moreover, according to statistical principles, regression models benefit from larger sample sizes because they allow for more accurate parameter estimates and reduce the potential for multicollinearity or other biases that can distort the interpretation of the results. The 21070 observations far exceed common thresholds for sample size adequacy in regression analysis, which typically suggest a minimum of 10-20 observations per independent variable. Given the complexity of the MOS, which integrates multiple metrics, this large sample size is particularly important to ensure that the relationships are accurately captured.

Initially, multiple linear regression was used to simultaneously develop a mathematical relationship between the study's independent variables and an interval dependent variable, namely the MOS, since multivariate analysis makes it possible to better identify the relationships between variables as it considers the effects of all the independent variables on the dependent variable (Malhotra, 2012).

Table 3

Linear regression model summary^b

Model	R	R-squared	R-squared adjusted	Standard error of estimate	Change statistics				
					Change in R-squared	Change F	df1	df2	Sig. change F
1	,771 ^a	0,595	0,595	0,63643183	0,595	2533,312	4	6892	0

- a. Predictors: (constant), Zscore: Media Visibility, Zscore (Engaged), Zscore (Readership), Zscore (Favorability)
- b. Dependent variable; Zscore: MOS

Based on the summary of the model presented on Table 3, we can draw the following conclusions:

In this model the coefficient of determination (R-squared) is 0.595, indicating that approximately 59,5% of the variability in the dependent variable (MOS) is explained by the independent variables (media visibility, readership, etc.). This is a moderately strong relationship, which suggests that the model is able to capture a significant portion of the variation in media coverage performance. The standard error of the estimate of approximately 0,63643183, reflects the average distance between the predicted and observed values, with lower values indicating better predictive accuracy.. The R-squared change statistic is 2533,312, with an F-value of 6892 and very low statistical significance (p-value of 0,000). This indicates that including the independent variables in the model resulted in a significant improvement in the model's ability to explain the variation in the Zscore: MOS.

To assess the presence of multicollinearity in the model, the Variance Inflation Factor (VIF) was calculated for each independent variable (Table 4). The VIF values indicate the degree to which multicollinearity may be inflating the variance of the regression coefficients. The model presented was estimated using centered variables, i.e. the interactions were only made after the variables had been centered. The independent variables were centered in order to reduce the multicollinearity resulting from the multiplicative effects, i.e. their value was subtracted from their average, resulting in new variables with an average of zero. The regression analysis shows that multicollinearity is well-controlled, as indicated by the Variance Inflation Factor (VIF) values for each independent variable. All VIF values are close to 1—specifically, Favorability (1,02),

Engagement (1,002), Readership (1.019), and Media Visibility (1,003)—which suggests minimal correlation between the variables. A VIF near 1 indicates that each variable contributes uniquely to the model without inflating the variance of the regression coefficients due to collinearity.

These low VIF values demonstrate that the predictors are largely independent, meaning that each metric, such as favorability or readership, captures a distinct aspect of media performance. The large dataset of 21,070 observations further helps to stabilize the model and reduce random variability, ensuring that the relationships between the variables are clear and reliable. Multicollinearity is not a concern in this model, and the independent variables can be confidently interpreted as distinct contributors to the MOS.

To test the hypotheses, a series of regressions were estimated. To avoid problems of multicollinearity arising from the interactions, separate regressions were estimated for each independent variable, along with the respective interactions. As is traditional, the main effects were entered in an initial model and interactions were entered in a subsequent model (ensuring that the models are hierarchically well-constructed). Note that relationships with a significance of up to 0,10 in two-band tests are considered significant, which corresponds to a significance of 0,05 in one-band tests.

Table 4

Linear regression coefficients

Model	Non-standardized coefficients		Standardized coefficients	t	Sig.	95,0% confidence interval for B		Collinearity statistics	
	B	Standard error	Beta			Lower limit	Upper limit	Tolerance	VIF
1 (constant)	6,71E-15	0,008		0	1	-0,015	0,015		
Zscore (Favorability)	0,674	0,008	0,674	87,035	0	0,659	0,689	0,98	1,02
Zscore (Engaged)	0,332	0,008	0,332	43,222	‘000	0,317	0,347	0,998	1,002
Zscore (Readership)	0,029	0,008	0,029	3,687	0	0,013	0,044	0,981	1,019
Zscore:Media Visibility	0,078	0,008	0,078	10,223	0	0,063	0,094	0,997	1,003

a. Dependent variable: Zscore:MOS

Based on the coefficients presented in the table 4, we can draw the following conclusions:

The variable "Zscore (Favorability)" has a standardized coefficient of 0,674, which indicates a significant positive relationship with the Zscore:MOS. This means that an increase in the favorability of the news is associated with an increase in the MOS. The variable "Zscore (Engaged)" (Engagement) has a standardized coefficient of 0,332, which indicates a significant positive relationship with the Zscore: MOS. In other words, an increase in Engagement is associated with an increase in MOS. The variable "Zscore (Readership)" has a standardized coefficient of 0,029, which indicates a significant positive relationship with the Zscore:MOS. This suggests that an increase in news readership is associated with an increase in MOS. The variable "Zscore: Media Visibility" has a standardized coefficient of 0,078, which indicates a significant positive relationship with the Zscore:MOS. This indicates that an increase in media visibility is associated with an increase in MOS.

4.2.1 Linear regression for Altice/MEO

The model has a good fit to the data (Table 5), as indicated by the adjusted R-squared value of 0,577. This means that around 57,7% of the variability in the Zscore:MOS can be explained by the independent variables included in the model.

The p-value (sig.) associated with all the independent variables is less than 0,05, indicating the statistical significance of the estimated coefficients. This suggests that the independent variables have a statistically significant impact on Altice/MEO's Zscore:MOS.

Table 5

Linear regression model summary^{bc} applied to Altice/MEO

Model	R		R squared	R adjusted	Standard error of estimate	Change statistics				
	Altice/MEO (Selected)	Altice/MEO (Not selected)				Change in R-squared	Change F	df1	df2	Sig. change F
1	,759 ^a	0,795	0,577	0,576	0,8122985	0,577	908,783	4	2668	0,000

- a. Predictors: (constant), Zscore:Media Visibility, Zscore (Engaged), Zscore (Readership), Zscore(Favorability)
- b. Unless otherwise stated, the statistics are based only on cases where brand=Altice/MEO
- c. Dependent variable: Zscore: MOS

The analysis of variance (ANOVA) (Table 6) indicates that the regression is statistically significant, with a p-value < 0,001. This means that the model is able to explain the variability observed in the Zscore:MOS.

Table 6

Linear regression analysis of variance (ANOVA^{a,b}) applied to Altice/MEO

Model		Sum of Squares	df	Average square	Z	Sig.
1	Regression	2398,565	4,000	599,641	908,783	,000 ^c
	Waste	1760,423	2668	0,660		
	Total	4158,989	2672			

- a. Dependent variable: Zscore:MOS
- b. Selected only cases where the brand = Altice/MEO
- c. Predictors: (constant), Zscore:Media Visibility, Zscore(Engaged), Zscore(Favorability), Zscore(Readership)

The unstandardized coefficients (Table 7) provide information on the relationship between the independent variables (Zscore: Media Visibility, Zscore(Engaged), Zscore(Favorability) and Zscore(Readership) and the dependent variable (Zscore: MOS) for the company Altice/MEO.

- Zscore(Favorability): The positive coefficient of 0,760 for Zscore (Favorability) in the regression analysis, with a p-value < 0,001, confirms that an increase in favorability is strongly associated with an increase in the

Media Output Score (MOS). This finding aligns with existing literature, where media favorability has been shown to play a pivotal role in shaping public perception and corporate reputation. Studies by Carroll & McCombs (2003) and Deephouse (2000) highlight that positive media coverage not only influences how the public views a company but also enhances its overall reputation and market performance. The strong relationship observed in the analysis supports the notion that favorable media sentiment significantly drives media performance, reinforcing the importance of managing positive media narratives to strengthen brand perception.

- Zscore(Engaged): The positive coefficient of 0,326 for Zscore (Engaged), with a p-value $< 0,001$, indicates that higher audience engagement is significantly associated with an increase in the Media Output Score (MOS). This finding is supported by literature emphasizing the role of engagement in amplifying media impact and shaping public perception. Studies suggest that high levels of interaction, such as shares, comments, and likes, enhance the visibility and reach of media content, thereby increasing its influence on brand reputation. Engagement is a key metric in modern media performance evaluation, as highlighted by researchers like Berger & Milkman (2012), who found that content that engages audiences more deeply tends to be more widely shared and impactful. Thus, the strong relationship between engagement and MOS reinforces the importance of fostering audience interaction to boost media performance and enhance brand visibility. The variable Zscore(Engaged) has a positive coefficient of 0,326, with a p-value $< 0,001$. This suggests that an increase in Zscore(Engaged) is related to an increase in Zscore: MOS.
- Zscore(Readership): The positive coefficient of 0,033 for Zscore (Readership), with a p-value of 0,040, indicates that while an increase in readership is associated with a rise in the Media Output Score (MOS), its impact is less pronounced compared to other variables. This aligns with the literature, which recognizes readership as an important, though not the sole, factor influencing media performance. Studies, such as those by Dyck and Zingales (2002), emphasize that higher readership extends the reach of media content, but its effect on brand perception is often mediated by factors

like engagement and favorability. Thus, while readership contributes to media visibility and potential influence, it plays a more supporting role in driving overall media performance, as reflected by the relatively lower coefficient in this analysis.

- Zscore: Media Visibility: The positive coefficient of 0,121 for Zscore (Media Visibility), with a p-value $< 0,001$, indicates that greater media visibility is significantly associated with an increase in the Media Output Score (MOS). This finding is consistent with literature emphasizing the importance of visibility in shaping public perception and enhancing media performance. According to agenda-setting theory (McCombs & Shaw, 1972), media visibility plays a crucial role in determining which brands or issues capture public attention. As highlighted by Manheim (2011), media visibility, through factors like frequency and prominence, increases a brand's exposure to its audience, which, in turn, positively affects media performance. Although its impact is smaller than that of engagement or favorability, media visibility remains a key driver in amplifying the reach and influence of media coverage.

The standardized regression coefficients indicate that all independent variables have a significant effect on the Zscore: MOS for the Altice/MEO company. More specifically:

- Zscore(Favorability): An increase of one standard deviation in Zscore(Favorability) is associated with an increase of 0,641 standard deviations in Zscore: MOS.
- Zscore(Engaged): An increase of one standard deviation in Zscore(Engaged) is associated with an increase of 0.378 standard deviations in Zscore: MOS.
- Zscore(Readership): An increase of one standard deviation in Zscore(Readership) is associated with an increase of 0,027 standard deviations in Zscore: MOS.
- Zscore: Media Visibility: An increase of one standard deviation in Zscore: Media Visibility is associated with an increase of 0,103 standard deviations in Zscore: MOS.

Table 7

Linear regression coefficients^{ab} applied to Altice/MEO

Model	Non-standardized coefficients		Standardized coefficients	t	Sig.	95,0% confidence interval for B		Collinearity statistics	
	B	Standard error	Beta			Lower limit	Upper limit	Tolerance	VIF
1 (constant)	-0,033	0,016		-2,075	0,038	-0,065	-0,002		
Zscore(Favorability)	0,76	0,016	0,641	48,938	0	0,73	0,791	0,925	1,081
Zscore(Engaged)	0,326	0,011	0,378	30,029	‘000	0,305	0,347	0,999	1,001
Zscore(Readership)	0,033	0,016	0,027	2,056	0,04	0,002	0,065	0,923	1,084
Zscore:Media Visibility	0,121	0,015	0,103	8,156	0	0,092	0,15	0,994	1,006

- a. Dependent variable: Zscore:MOS
- b. Selected only cases where the brand = Altice/MEO

The collinearity statistics (tolerance and VIF) indicate that the values are within an acceptable range, with tolerance above 0,2 and VIF below 5, which suggests that multicollinearity is not a significant concern.

In summary, according to the model applied to Altice/MEO's data, Zscore(Favorability), Zscore(Engaged) and Zscore: Media Visibility are the variables that have the greatest impact on Zscore: MOS. The variable Zscore(Readership) also has a positive effect, but to a lesser extent. These results suggest that Altice/MEO can benefit from focusing on improving favorability, engagement and media visibility to increase its Zscore: MOS.

4.2.2 Linear regression for NOS

The model has a good fit to the data (Table 8), as indicated by the adjusted R-squared value of 0,627. This means that around 62,7% of the variability in the Zscore: MOS can be explained by the independent variables included in the model.

Table 8

Linear regression model summary^{bc} applied to NOS

Model	R		Change statistics							
	NOS (Selected)	NOS (Not selected)	R squared	R squared adjusted	Standard error of estimate	Change in R-squared	Change F	df1	df2	Sig. change F
1	,792 ^a	0,759	0,627	0,626	0,47321918	0,627	1072,402	4	2551	0,000

- a. Predictors: (constant), Zscore:Media Visibility, Zscore (Engaged), Zscore (Readership), Zscore(Favorability)
- b. Unless otherwise stated, the statistics are based only on cases where brand=NOS
- c. Dependent variable: Zscore: MOS

The ANOVA analysis (Table 9) shows that the regression is statistically significant, with a p-value (sig.) close to zero. This indicates that the model is statistically significant in explaining the variability in the NOS company's Zscore: MOS.

Table 9

Linear regression analysis of variance (ANOVA^{ab}) applied to NOS

Model		Sum of Squares	df	Average square	Z	Sig.
1	Regression	960,599	4	240,15	1072,402	,000 ^c
	Waste	571,262	2551	0,224		
	Total	1531,861	2555			

- a. Dependent variable: Zscore:MOS
- b. Selected only cases where the brand = NOS
- c. Predictors: (constant), Zscore:Media Visibility, Zscore(Engaged), Zscore(Favorability), Zscore(Readership)

The regression coefficients (Table 10) indicate that all the independent variables have a significant effect on the Zscore: MOS for the NOS company. More specifically:

- Zscore(Favorability): An increase of one standard deviation in Zscore(Favorability) is associated with an increase of 0,680 standard deviations in Zscore: MOS.

- Zscore(Engaged): An increase of one standard deviation in Zscore(Engaged) is associated with an increase of 0,250 standard deviations in Zscore: MOS.
- Zscore(Readership): An increase of one standard deviation in Zscore(Readership) is associated with an increase of 0,052 standard deviations in Zscore: MOS.
- Zscore: Media Visibility: An increase of one standard deviation in Zscore: Media Visibility is associated with an increase of 0,153 standard deviations in Zscore: MOS.

Table 10

Linear regression coefficients^{ab} applied to NOS

<i>Model</i>	<i>Non-standardized coefficients</i>		<i>Standardized coefficients</i>	<i>t</i>	<i>Sig.</i>	<i>95,0% confidence interval for B</i>		<i>Collinearity statistics</i>	
	<i>B</i>	<i>Standard error</i>	<i>Beta</i>			<i>Lower limit</i>	<i>Upper limit</i>	<i>Tolerance</i>	<i>VIF</i>
<i>1 (constant)</i>	<i>0,043</i>	<i>0,010</i>		<i>4,392</i>	<i>0,000</i>	<i>0,024</i>	<i>0,062</i>		
<i>Zscore(Favorability)</i>	<i>0,553</i>	<i>0,010</i>	<i>0,680</i>	<i>54,482</i>	<i>0,000</i>	<i>0,533</i>	<i>0,572</i>	<i>0,938</i>	<i>1,066</i>
<i>Zscore(Engaged)</i>	<i>0,350</i>	<i>0,017</i>	<i>0,250</i>	<i>20,578</i>	<i>0,000</i>	<i>0,317</i>	<i>0,384</i>	<i>0,993</i>	<i>1,007</i>
<i>Zscore(Readership)</i>	<i>0,042</i>	<i>0,010</i>	<i>0,052</i>	<i>4,256</i>	<i>0,000</i>	<i>0,023</i>	<i>0,061</i>	<i>0,992</i>	<i>1,008</i>
<i>Zscore:Media Visibility</i>	<i>0,131</i>	<i>0,011</i>	<i>0,153</i>	<i>12,362</i>	<i>0,000</i>	<i>0,111</i>	<i>0,152</i>	<i>0,949</i>	<i>1,053</i>

- a. Dependent variable: Zscore:MOS
- b. Selected only cases where the brand = NOS

The p-value (sig.) associated with all the independent variables is less than 0,05, indicating the statistical significance of the estimated coefficients. This suggests that the independent variables have a statistically significant impact on the NOS company's Zscore: MOS.

Based on the results of the model, it can be concluded that the variables Zscore(Favorability), Zscore(Engaged), Zscore(Readership) and Zscore: Media Visibility have a significant impact on the performance of the NOS company, as measured by the Zscore: MOS. These variables are important for understanding and predicting the company's performance in the market.

4.2.3 Linear regression for Vodafone

The model has a good fit to the data (Table 11), as indicated by the adjusted R-squared value of 0,668. This means that around 66,8% of the variability in the Zscore: MOS can be explained by the independent variables included in the model.

Table 11

Model summary^{bc} applied to Vodafone

Model	R		Change statistics							
	Vodafone (Selected)	Vodafone (Not selected)	R squared	R squared adjusted	Standard error of estimate	Change in R-squared	Change F	df1	df2	Sig. change F
1	,817 ^a	0,749	0,668	0,667	0,47794542	0,668	836,624	4	1663	,000

- a. Predictors: (constant), Zscore:Media Visibility, Zscore (Engaged), Zscore (Readership), Zscore(Favorability)
- b. Unless otherwise stated, the statistics are based only on cases where brand=Vodafone
- c. Dependent variable: Zscore: MOS

The ANOVA analysis (Table 12) shows that the regression is statistically significant, with a p-value (sig.) close to zero. This indicates that the model is statistically significant in explaining the variability in Vodafone's Zscore: MOS.

Table 12

Analysis of variance (ANOVA^{ab}) applied to Vodafone

Model		Sum of Squares	df	Average square	Z	Sig.
1	Regression	764,446	4	181,111	836,624	,000 ^c
	Waste	379,882	1663	,228		
	Total	1144,328	1667			

- a. Dependent variable: Zscore:MOS
- b. Selected only cases where the brand = Vodafone
- c. Predictors: (constant), Zscore:Media Visibility, Zscore(Engaged), Zscore(Favorability), Zscore(Readership)

The regression coefficients (Table 13) indicate that the independent variables have a significant effect on the Zscore: MOS for the Vodafone company. More specifically:

- Zscore(Favorability): An increase of one standard deviation in Zscore(Favorability) is associated with an increase of 0,763 standard deviations in Zscore: MOS.
- Zscore(Engaged): An increase of one standard deviation in Zscore(Engaged) is associated with an increase of 0,256 standard deviations in Zscore: MOS.
- Zscore(Readership): A decrease of one standard deviation in Zscore(Readership) is associated with a decrease of 0,011 standard deviations in Zscore: MOS.
- Zscore: Media Visibility: A decrease of one standard deviation in Zscore: Media Visibility is associated with a decrease of 0,015 standard deviations in Zscore: MOS.

Table 13

Linear regression coefficients^{ab} applied to Vodafone

Model	Non-standardized coefficients		Standardized coefficients	t	Sig.	95,0% confidence interval for B		Collinearity statistics	
	B	Standard error	Beta			Lower limit	Upper limit	Tolerance	VIF
1 (constant)	0,005	0,012		0,449	0,653	0,018	0,029		
Zscore(Favorability)	0,668	0,012	0,763	53,916	0	0,644	0,693	0,996	1,004
Zscore(Engaged)	0,385	0,021	0,256	17,993	‘000	0,343	0,427	0,99	1,01
Zscore(Readership)	0,009	0,012	0,011	-0,759	0,448	0,032	0,014	0,991	1,009
Zscore:Media Visibility	0,013	0,012	0,015	-1,087	0,277	0,035	0,01	0,996	1,004

- a. Dependent variable: Zscore:MOS
- b. Selected only cases where the brand = Vodafone

The p-value (sig.) associated with some independent variables is greater than 0.05, indicating that these variables may not be statistically significant in explaining the variability in Vodafone's Zscore: MOS.

Based on the results of the model, it can be concluded that the variables Zscore(Favorability) and Zscore(Engaged) have a significant impact on the performance of the Vodafone company, as measured by the Zscore: MOS. However, the variables Zscore(Readership) and Zscore: Media Visibility are not statistically significant in this

context. It is important to consider these results when analyzing and predicting Vodafone's performance in the market.

4.3 Key Findings from the first case study: Telecommunications sector in Portugal between 2021 and 2023

Between January 1st, 2021 and December 31st, 2023, a total of 71707 records of references to these brands were identified and distributed as follows:

- Altice/MEO, 30552 mentions;
- NOS, 24078 mentions;
- Vodafone, 17107 mentions.

For the case study, the 11 online media outlets that carried the most news about the three operators were selected to be the sample. The final dataset sample resulted in a total of 21070 records, 7708 with reference to Altice/MEO, 8676 with reference to NOS and 4686 with reference to Vodafone. These news items registered a total of 800786 interactions on Facebook, divided into 118775 comments, 452361 likes and 208580 shares.

The target geographic scope of the study, considering the Telecommunications industry target, was defined as the Portuguese population over 14 years of age, in a total universe of 8988124 individuals. The brand's communication goals were defined as contact with the target population, and weights were assigned to the media, considering their ability to influence the target population, particularly regarding decision makers for the choice of the telecommunications operator in Portugal.

The attribution of weights was carefully designed based on a comprehensive understanding of the media landscape, as assessed by a specialist in communication analysis within the telecommunications sector in Portugal. This process accounted for several critical factors that communication professionals must consider when evaluating the influence and effectiveness of media outlets in delivering targeted messages to the right audiences. The primary criterion for weighting each media outlet was its credibility and established reputation within the industry. Credibility is a fundamental attribute, as trusted media sources have a greater capacity to shape public opinion and drive decision-making among key stakeholders. Research has shown that media

credibility directly impacts how messages are perceived by audiences, with trusted outlets being more likely to influence opinions and decisions effectively (Kiouisis, 2001). Trusted outlets were assigned higher weights due to their enhanced potential to influence decision-makers in the telecommunications field. In addition to credibility, the weight attribution considered the influence of each media outlet, particularly its ability to reach decision-makers who play a pivotal role in selecting telecommunications services. These decision-makers require specialized, in-depth information, and media outlets that cater to niche markets were given significant weight due to their ability to provide focused, detailed analysis. Media influence and credibility are central in the agenda-setting process, shaping both public and professional priorities (McCombs & Reynolds, 2002). The potential to drive decisions among opinion leaders and decision-makers was another critical factor. Media outlets with strong relationships to industry experts and thought leaders—those who often shape strategic decisions—were given higher weights. Research supports the idea that credible media outlets play a key role in forming the public and expert agenda, especially when focused on issues of high relevance to decision-makers (McCombs & Reynolds, 2002). The balance between audience reach and message precision was also considered. While broad-reach outlets were valued for creating general visibility, niche media that target specialized audiences with in-depth content were weighted more heavily for their ability to influence decision-makers with technical insights. This dual approach ensures that the MOS reflects both widespread awareness and the focused impact required to drive decisions in the telecommunications sector. The weight attribution process integrates the key considerations for communication professionals, including media credibility, influence, audience reach, and the potential to drive decisions. By prioritizing outlets that effectively target both the general public and high-level decision-makers, the MOS provides a comprehensive measure of media performance that captures the full scope of media's role in shaping opinions and strategic choices in the telecommunications industry. Furthermore, the potential to drive decisions among opinion leaders and decision-makers was another key factor. Media outlets that possess strong relationships with industry experts and thought leaders—those who often shape the strategic decisions of businesses—were given higher weights. The logic behind this is that while broader media outlets serve to create general awareness among the population, niche, specialized media have the unique ability to sway the perspectives of those with direct decision-making power. The balance between audience reach and message precision

was considered in the weighting process. Outlets with a broad reach across the Portuguese population were important for establishing visibility and creating widespread awareness of telecommunications brands and services. At the same time, media that focus on more technical or specialized content—which might cater to smaller but more influential audiences—were valued for their ability to communicate the deeper, more complex aspects of telecommunications products and services. In essence, the criteria for weight attribution in the MOS reflect a strategic blend of reach, credibility, influence, and the ability to drive decisions. By carefully evaluating each media outlet's potential to effectively communicate with both the general public and high-level decision-makers, the weighting system ensures that the MOS provides a comprehensive and accurate measure of media performance—capturing everything a communication professional needs to know about the media's role in shaping public and professional opinion in the telecommunications sector.

This approach parallels practices in other fields, such as machine learning, where experts are employed to train and refine models. The readership of each of the selected media outlets was determined based on total monthly visits, the average number of news articles consulted, and the average number of news articles published daily.

Table 14

Data from the media analyzed for telecommunications industry and respective weights

Media Outlet	Number of articles	Daily visitors	Pages per visit	Average daily articles	Readership	Weight for Telecom	Telecom readership
Sapo	2699	282086	4,65	147	8923	40%	3569
Notícias ao Minuto	1913	960371	1,92	500	3688	30%	1106
Jornal Económico	1644	182490	2,67	95	5129	70%	3590
Dinheiro Vivo	1539	69309	1,98	50	2745	80%	2196
ECO - Economia	1534	143501	1,69	59	4110	80%	3288
Negócios	1348	210261	2,03	94	4541	80%	3633
Observador	859	440954	2,26	210	4746	90%	4271
Expresso	856	499862	1,9	117	8117	100%	8117
Executive Digest	778	67982	1,96	48	2776	80%	2221
RTP	763	436547	2,99	247	5285	60%	3171
Visão	736	119114	1,93	125	1839	70%	1287

In table 14, we can see the results from the media analyzed and respective weights, according to the following variables:

- Media Outlets - Media selected for the analysis sample according to the criterion of the 11 media outlets that made the most mentions to the three telecommunication market players.
- Number of articles - Number of articles with mentions to the three brands under analysis (Altice/MEO, NOS, and Vodafone) during the year 2022.
- Daily Visitors - Number of daily visitors to the media website according to Similar Web.
- Pages per visit. Average number of pages visited on each website by its total visitors.
- Average daily articles published. Number of articles published on average per day on each website based on the count of total posts shared in the week between May 1 and May 7, 2023, a random week selected to calculate the average post frequency per website.
- Readership - Estimated number of impressions per news item according to the methodology described above.
- Weight for Telecommunications - Percentage weight of each website for the industry defined by a specialist according with the criteria explained above.
- Telecommunications Readership on Target - Readership that will be considered for MOS calculation, considering the relevance of the media outlet to the Telecommunications industry in Portugal.

Before delving into the detailed analysis of the Media Output Score (MOS) and its underlying metrics for the telecommunications brands under study, it is essential to contextualize these results within the broader landscape of the telecommunications sector in Portugal. The following paragraphs provide an overview of the significant technological, regulatory, and market developments that may have shaped the performance and media coverage of the main players in the market during the period under analysis (2021-2023). This context will offer valuable insights into how external factors may have influenced the media presence and public perception of Altice/MEO, NOS, and Vodafone.

The telecommunications market in Portugal has undergone significant transformations

over the past few decades, driven by rapid technological advancements, regulatory reforms, and shifts in consumer behavior. As a vital sector underpinning the digital economy, telecommunications in Portugal is characterized by a competitive landscape with several key players vying for market share across fixed-line, mobile, broadband, and television services. The evolution of this market is shaped not only by local dynamics but also by global trends such as the proliferation of 5G technology, increasing demand for high-speed internet, and the convergence of telecom services with digital content and media. Portugal's telecommunications sector has been influenced by both domestic policy decisions and broader European Union directives aimed at fostering competition and enhancing consumer choice. The liberalization of the market, which began in the 1990s, has seen the entry of new operators, investment in infrastructure, and a push towards innovation and service diversification. Major companies such as Altice Portugal (operating under the MEO brand), NOS, and Vodafone Portugal dominate the market, each adopting unique strategies to differentiate themselves and capture different segments of the consumer base.

Over the course of 2021 to 2023, notable shifts occurred in the Portuguese telecommunications industry, influenced by technological advancements, regulatory developments, economic challenges, and notable events that captured public attention. This period was marked by a mix of opportunities and challenges for telecom operators, influenced by both global trends and local dynamics. Each year brought unique circumstances that shaped the strategic priorities of companies and the overall market environment.

The year 2021 was pivotal for the Portuguese telecommunications sector, characterized by significant developments in technology, regulation, and corporate controversies. One of the main themes was the expansion and rollout of 5G networks following the completion of the 5G spectrum auction. Despite facing delays and disputes, telecom operators such as Altice Portugal/MEO, NOS, and Vodafone Portugal invested heavily in building the necessary infrastructure, focusing on expanding coverage in urban areas and preparing for broader national deployment. The rollout of 5G was seen as a critical driver for innovation, enabling new applications and services across various sectors.

However, 2021 was also marked by corporate turbulence and labor disputes. A major event was the collective dismissal announced by Altice Portugal, which led to widespread protests and demonstrations organized by unions representing telecom

workers. The struggle culminated in a significant strike, reflecting deep discontent among employees over job cuts and working conditions. The dismissal and subsequent labor actions highlighted tensions within the industry regarding workforce management amidst technological shifts and cost-cutting measures.

Additionally, the year was overshadowed by a high-profile investigation by the public prosecutor's office into the television contract deal between FC Porto and Altice. This investigation brought to light concerns about potential corruption and unfair practices in the negotiation of broadcast rights, drawing significant media attention and public scrutiny. These controversies highlighted the intersection of corporate governance issues and the broader regulatory environment, further complicating the landscape for telecom operators.

Price increases also emerged as a significant issue in 2021, with consumers facing higher costs for telecom services. This trend was driven by rising operational expenses, investments in new technology like 5G, and inflationary pressures. These price hikes prompted regulatory scrutiny and public debate over affordability and fairness in the telecommunications market.

Building on the developments of 2021, the Portuguese telecommunications sector in 2022 focused on accelerating 5G deployment and addressing new challenges in cybersecurity, regulation, and market dynamics. The enhanced rollout and adoption of 5G networks continued, with operators expanding coverage to rural and underserved areas and developing new services leveraging 5G's capabilities. The emphasis was on optimizing network performance and exploring innovative applications, particularly for businesses looking for advanced connectivity solutions.

A major event that shook the sector in 2022 was the cyberattack on Vodafone Portugal. This cyberattack disrupted services across the country, affecting millions of customers and exposing vulnerabilities in the telecom infrastructure. The incident underscored the importance of robust cybersecurity measures and prompted telecom operators to invest heavily in enhancing their security frameworks. The attack also drew attention to the increasing sophistication of cyber threats and the need for greater collaboration between industry players and government agencies to safeguard critical infrastructure.

Regulatory actions continued to shape the market in 2022, particularly concerning consumer protection and service transparency. Vodafone was ordered to refund amounts

charged for activating additional services not requested by customers, highlighting ongoing issues related to billing practices and service transparency in the sector. These regulatory measures aimed to protect consumer rights and ensure fair competition, reinforcing the need for telecom operators to maintain high standards of customer service and transparency.

The focus on sustainability and ESG goals remained strong in 2022, reflecting broader global trends and regulatory expectations. Telecom operators increasingly incorporated sustainability into their business strategies, with investments in energy-efficient technologies, renewable energy, and circular economy practices becoming more prominent. This alignment with national and EU sustainability goals underscored the sector's commitment to promoting environmental stewardship while enhancing operational efficiency.

The year 2023 marked a period of maturation and continued evolution for the Portuguese telecommunications market. Telecom operators focused on optimizing 5G networks and expanding digital services, moving from initial deployment phases to widespread commercialization. The emphasis was on enhancing network performance and developing differentiated services, such as advanced mobile broadband, ultra-low latency applications, and private networks for enterprises, reflecting a shift towards more sophisticated and value-added offerings.

However, 2023 was also a year of significant legal and corporate turbulence, most notably marked by the arrest of Armando Pereira, co-founder of Altice, on charges of corruption and tax fraud. This scandal, which attracted substantial media attention, raised serious concerns about corporate governance and ethical practices within one of the country's leading telecom companies. The investigation into Pereira and Altice not only impacted the company's reputation but also prompted broader scrutiny of corporate practices in the telecommunications sector. It highlighted the challenges of maintaining ethical standards amidst intense competition and complex market dynamics.

Economic challenges also came to the fore in 2023, driven by inflationary pressures, rising energy costs, and geopolitical tensions. These factors forced telecom operators to navigate a difficult economic landscape while maintaining profitability. Strategies included optimizing operational efficiencies, cost management, and exploring cost-sharing opportunities through network-sharing agreements. Despite these

challenges, operators continued to invest in critical infrastructure like 5G and fiber networks, recognizing their importance in driving future growth and competitiveness.

Consumer experience and service differentiation remained a key focus in 2023, with telecom operators enhancing customer engagement through digital platforms and introducing new pricing models and value-added services. The competitive landscape drove innovation in service offerings, with companies leveraging emerging technologies such as AI, IoT, and edge computing to deliver personalized and differentiated services.

Table 15

Key Performance Indicators with MOS and its foundation metrics using the telecommunications case study dataset

Year: 2021

Brands	Frequency (articles)	Share of Voice (%)	Readership on target (Impressions)	Engaged (Interactions)	Favorability (Average)	Media Output Score
Altice/Meo	3267	38,47%	10340498	184728	0,08	17,01 Moderate
NOS	3359	39,55%	10670124	123562	0,2	59,04 Excelent
Vodafone	1866	21,97%	5668713	51438	0,16	24,74 Moderate

Year: 2022

Brands	Frequency (articles)	Share of Voice (%)	Readership on target (Impressions)	Engaged (Interactions)	Favorability (Average)	Media Output Score
Altice/Meo	1812	29,33%	5974757	76978	0,33	42,83 Robust
NOS	2650	42,89%	8431381	72122	0,24	56,45 Robust
Vodafone	1717	27,79%	5605558	79968	-0,03	-4,14 Vulnerable

Year: 2023

Brands	Frequency (articles)	Share of Voice (%)	Readership on target (Impressions)	Engaged (Interactions)	Favorability (Average)	Media Output Score
Altice/Meo	2629	41,08%	8851344	92968	0,05	2,9 Moderate
NOS	2667	41,68%	8264197	52779	0,14	33,66 Robust
Vodafone	1103	17,24%	3523679	45198	0,15	14,79 Moderate

In order to study the MOS results taking into account the metrics that make them up, in the table 15 we can see the results by year and by brand taking into account frequency, share of voice, Readership on target, Engaged, Favorability and Media Output Score.

The study focuses on major telecom brands operating in Portugal, analyzing their media coverage through several key metrics. Frequency refers to the total number of news items mentioning each brand, while Share of Voice is the percentage representation of each brand based on this frequency. Readership on target measures the total impressions of each brand across all mentioned news items, considering the target audience as defined by the media outlets' tier classification in line with the communication goals. Engaged denotes the total number of interactions (likes, shares, and comments) on social networks associated with the news mentioning each brand. Favorability is calculated as the average sentiment toward the brand in the news, rated on a scale from -1,04 to +0,98, with categories ranging from positive to negative. The Media Output Score (MOS) is a newly proposed metric that measures the output performance of media coverage, assessing its effect on the Portuguese population within the telecom market. This score is interpreted on a scale developed for the study, categorizing the performance as Excellent, Robust, Moderate, Vulnerable, or Weak.

Comparing individually all the metrics (Table 15), it is possible to verify that the introduction of the qualitative component marked by Favorability in the MOS calculation basis allows demonstrating the effects of negative favorability on the brands' performance.

In linear observation it is possible to establish total parallelism between frequency, share of voice, readership, and engagement.

When introducing the qualitative effect of favorability that underlies the MOS metric, it is possible to see a strong penalization of the Vodafone brand result determined by the effect of the negative sentiment news in which it was mentioned in 2022, which caused its MOS to drop to a much lower result than the other brands.

This combination gives this new metric a fundamental qualitative dimension to evaluate the output of media coverage and to understand that negative news has a penalizing effect on the communicational performance of brands.

During 2021, Altice/Meo had a high frequency and SOV, indicating substantial media coverage. However, the low favorability score resulted in a relatively low MOS,

reflecting that much of the coverage was neutral or negative, thereby diminishing the brand's overall media impact.

Based on the data provided for the years 2021, 2022, and 2023, we can draw several conclusions about the performance of the three brands, Altice/Meo, NOS, and Vodafone, across the various metrics. In 2021, Altice/Meo had a strong presence with a Share of Voice of 38,47%, Readership on Target of over 10 million, and a Media Output Score categorized as "Moderate." However, its Avg Favorability was relatively low at 0,08. In 2022, despite a decline in Frequency and Readership, Altice/Meo improved its Avg Favorability significantly to 0,33, and its Media Output Score rose to "Robust." By 2023, Altice/Meo saw a recovery in Frequency and Share of Voice, though the Avg Favorability dropped again to 0,05, leading to a "Moderate" Media Output Score. NOS consistently maintained a leading position in terms of Share of Voice across all three years. In 2021, it had the highest Readership on Target and a Media Output Score rated as "Excellent." Although its Avg Favorability decreased slightly from 0,20 in 2021 to 0,14 in 2023, it managed to maintain a "Robust" Media Output Score in both 2022 and 2023, indicating strong media presence and audience engagement. Vodafone showed varying performance over the three years. In 2021, it had the lowest Share of Voice (21.97%) and a "Moderate" Media Output Score. In 2022, Vodafone's performance declined sharply with a negative Avg Favorability of -0,03 and a "Vulnerable" Media Output Score of -4,14. However, in 2023, Vodafone managed to recover slightly, improving its Avg Favorability to 0,15 and achieving a "Moderate" Media Output Score. Despite this improvement, its Share of Voice continued to decrease, indicating a reduced presence in the market.

Over the three years, NOS consistently had the highest Share of Voice, peaking in 2022 at 42,89%. Altice/Meo's Share of Voice was relatively stable, peaking in 2023 at 41,08%. Vodafone, on the other hand, saw a decline in Share of Voice each year, dropping from 21,97% in 2021 to 17,24% in 2023. This suggests that Vodafone's visibility in the market has been decreasing over time. Both Altice/Meo and NOS saw a decrease in Readership on Target from 2021 to 2022, followed by a partial recovery in 2023. Vodafone's Readership on Target has been consistently lower than the other two brands and continued to decline through 2023.

All three brands saw fluctuations in their engagement levels. Altice/Meo experienced a significant drop in engagement in 2022 but showed a slight recovery in 2023. NOS's

engagement has been decreasing year over year, suggesting a need to reinvigorate audience interest. Vodafone's engagement levels remained relatively steady, with a slight increase in 2022 but a decrease again in 2023.

The Average Favorability metric shows varied performance across the brands. Altice/Meo improved its favorability significantly in 2022 but could not maintain this in 2023. NOS saw a slight decline in favorability over the three years but remained positive overall. Vodafone's favorability was notably negative in 2022 but improved to a positive value in 2023, indicating a potential recovery in brand perception.

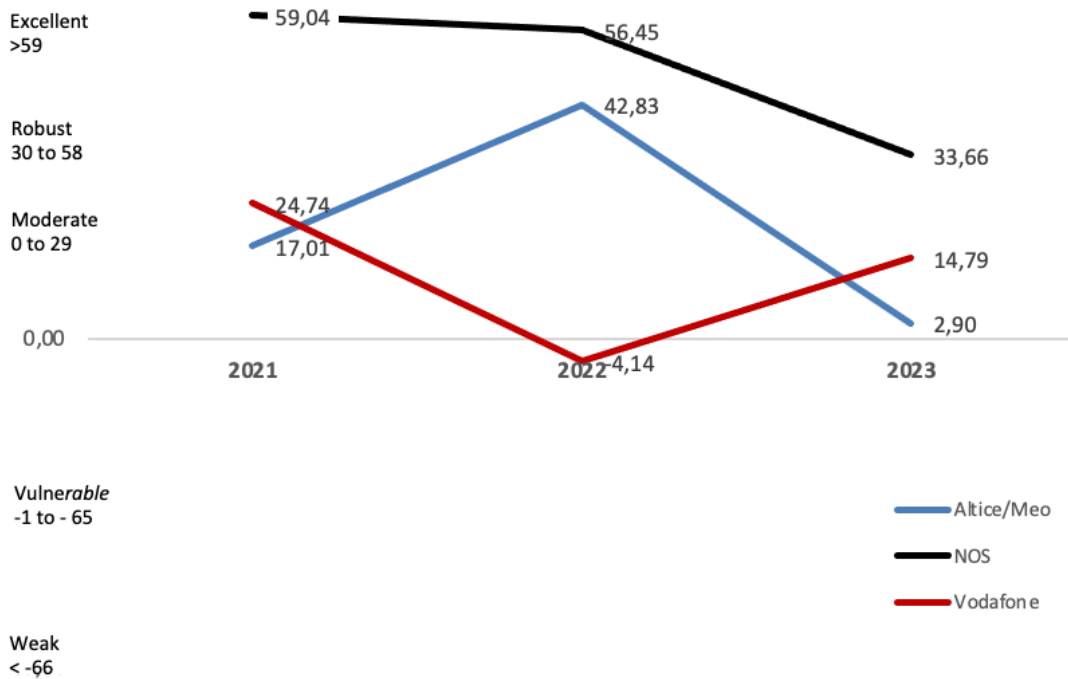
Both Altice/Meo and NOS maintained relatively strong Media Output Scores throughout the period, with Altice/Meo fluctuating between "Moderate" and "Robust," while NOS remained "Robust" except for an "Excellent" rating in 2021. Vodafone's Media Output Score was the most volatile, dropping to "Vulnerable" in 2022, which reflects a challenging year for the brand in terms of media performance and public perception motivated by the cyberattack. The brand managed to recover to a "Moderate" score in 2023, indicating a slight improvement.

The data suggests that NOS has consistently maintained a strong market presence and media performance across all three years, though with a slight decline in engagement and favorability. Altice/Meo demonstrated resilience, showing significant improvements in 2022 but fluctuating in other years. Vodafone faced challenges, particularly in 2022, but showed signs of recovery in 2023. Going forward, all three brands may benefit from strategies that boost engagement and favorability to strengthen their market positions further.

In Image 13 we can analyze a graph with the Media Output Score across the years for the 3 brands.

Image 13

Media Output Score Year by Year



Altice/MEO's Media Output Scores (MOS) over the period from 2021 to 2023 reflect a journey marked by significant fluctuations, influenced by both corporate controversies and efforts to rebuild its reputation. In 2021, Altice/MEO had a "Moderate" MOS of 17,01, indicating a year of mixed media coverage. This was largely due to several negative incidents, including a collective dismissal announcement that triggered labor unrest, protests, and a strike on July 22, which attracted considerable negative media attention. Additionally, the brand was implicated in "Operation Red Card," an investigation into a controversial television contract deal with FC Porto, further tarnishing its public image. These events led to a predominantly negative perception in the media, resulting in a moderate MOS. The year 2022 saw a significant improvement in Altice/MEO's MOS, rising to 42,83 and entering the "Robust" category. This increase suggests successful efforts by the company to manage its reputation and mitigate the damage from previous controversies. Altice/MEO likely focused on strategic communication, positive business developments, and perhaps new service offerings that generated favorable media coverage. The recovery in MOS indicates that while the

brand faced challenges, it managed to regain some trust and positive media sentiment. In 2023, Altice/MEO's MOS fell again to 2,90, reverting to the "Moderate" range. This decline was primarily driven by a significant scandal involving the arrest of Altice co-founder Armando Pereira on charges of corruption and tax fraud, which led to extensive negative media coverage. The scandal overshadowed any positive developments and brought renewed scrutiny to the company's practices, resulting in a lower score. The drop suggests ongoing reputational challenges despite previous recovery efforts.

NOS's Media Output Scores over the three years demonstrate a relatively stable and strong media presence, with the brand maintaining robust to excellent performance throughout. In 2021, NOS achieved an "Excellent" MOS of 59,04, reflecting highly favorable media coverage. This strong performance suggests that NOS successfully positioned itself positively in the media, likely through effective branding, strategic initiatives, and a lack of significant controversies. The company's focus on technological advancements and customer service might have contributed to its excellent media standing, enhancing its public image and securing widespread positive press. In 2022, NOS's MOS slightly decreased to 56,45, moving into the "Robust" category but still reflecting a strong media performance. The minor dip indicates that while NOS continued to enjoy positive coverage, there may have been fewer standout achievements or more competitive pressures in the market. However, NOS managed to sustain a solid media presence, likely due to consistent messaging, continued investment in technology, and a strong market position. By 2023, NOS's MOS further decreased to 33,66 but remained within the "Robust" range. This suggests that the brand continued to maintain a favorable media reputation, although with slightly reduced impact compared to previous years. The decline could reflect increased market competition or external economic factors. Despite this, NOS's ability to stay robust indicates effective crisis management, ongoing innovation, and a stable business strategy that kept the brand positively positioned in the media.

Vodafone's Media Output Scores reveal a journey of significant challenges followed by gradual recovery, highlighting its efforts to overcome crises and rebuild its media presence. In 2021, Vodafone had a "Moderate" MOS of 24,74, reflecting a balanced year with both positive and negative media coverage. The brand might have faced some operational challenges or competitive pressures that impacted its overall media

sentiment, but it also likely engaged in initiatives or maintained customer service standards that helped sustain a moderate score. The year 2022 was particularly challenging for Vodafone, as its MOS dropped to -4,14, falling into the "Vulnerable" category. This sharp decline was primarily due to a major cyberattack that disrupted services nationwide, leading to significant negative press and customer dissatisfaction. Additionally, Vodafone was ordered to refund customers for activating additional services without consent, further damaging its reputation and resulting in substantial negative coverage. These incidents severely impacted Vodafone's MOS, highlighting vulnerabilities in its operations and customer relations. In 2023, Vodafone's MOS improved to 14,79, moving back into the "Moderate" range. This recovery indicates efforts to rebuild the brand's reputation following the setbacks of 2022. The improvement in MOS suggests that Vodafone took proactive steps to enhance its cybersecurity measures, improve customer relations, and restore trust. Although the score remains moderate, it reflects a positive trajectory as the company worked to overcome the previous year's challenges and stabilize its media presence.

The comprehensive explanation of the MOS scores achieved by each of the brands and the events that marked each of the year's highlights the ability of this new metric to identify crisis situations in the performance of each of the brands. The results underscore the importance of strategic media management, effective crisis response, and sustained innovation in maintaining a favorable public image in the competitive telecommunications market.

In table 16 it's possible to understand that despite all brands having considerable unfavorable MOS, being Altice/MEO the most penalized brand with negative information, both Altice/MEO and NOS managed to counteract this trend by creating favorable stories that allowed them to achieve considerable positive results. On the other hand, Vodafone, despite also creating positive stories, was not as effective in countering the inherent negative trend, which gave it the worst performance result among the three brands.

Table 16

Media Output Score by favorability

Year: 2021

Brands	Favorable MOS	Unfavorable MOS	MOS
Altice/Meo	-51,08	68,09	17,01
NOS	-25,45	84,49	59,04
Vodafone	-8,91	33,65	24,74

Year: 2022

Brands	Favorable MOS	Unfavorable MOS	MOS
Altice/Meo	-25,09	67,92	42,83
NOS	-25,32	81,77	56,45
Vodafone	-45,11	40,97	-4,14

Year: 2023

Brands	Favorable MOS	Unfavorable MOS	MOS
Altice/Meo	-75,45	78,34	2,9
NOS	-34,26	67,91	33,66
Vodafone	-20,92	35,71	14,79

To better understand the overall performance of each brand, the MOS has been split into two components: Favorable MOS and Unfavorable MOS. This division allows for a more nuanced analysis of how each brand’s media presence was shaped by both positive and negative coverage over the years. The net MOS score, previously analyzed, is derived from the balance between these favorable and unfavorable elements.

Altice/MEO's performance across 2021 to 2023 shows significant variations in both favorable and unfavorable media coverage, reflecting ongoing challenges with its public image and attempts at reputation management. In 2021, Altice/MEO achieved a favorable MOS of 68,09, indicating a substantial amount of positive media coverage, likely due to its market presence and efforts in service offerings. However, the high

unfavorable MOS of -51,08, driven by labor disputes and the "Operation Red Card" investigation, considerably offset the positive coverage, resulting in a net MOS of 17,01. This "Moderate" rating suggests that while there were positive stories, they were heavily counterbalanced by negative press. In 2022, Altice/MEO's favorable MOS remained stable at 67,92, but the unfavorable MOS dropped to -25,09, indicating a reduction in negative media coverage. This shift reflects successful crisis management and possibly more favorable business developments or public relations efforts that improved the brand's overall media presence, leading to a higher net MOS of 42,83, categorized as "Robust." In 2023, Altice/MEO had a high favorable MOS of 78,34, suggesting continued efforts to generate positive media stories. However, the unfavorable MOS soared to -75,45, largely due to the arrest of co-founder Armando Pereira on corruption charges. This sharp increase in negative coverage drastically reduced the net MOS to 2,9, placing it again in the "Moderate" range and highlighting the impact of significant negative events.

NOS's MOS scores reveal a stable and strong media presence over the years, with the brand maintaining a favorable balance between positive and negative coverage. In 2021, NOS had a very high favorable MOS of 84,49, indicating widespread positive media coverage, likely due to successful business initiatives and a strong market position. The relatively low unfavorable MOS of -25,45 suggests that the brand effectively managed negative incidents, resulting in an "Excellent" net MOS of 59,04. This reflects a well-balanced media strategy with dominant positive coverage. NOS maintained a high favorable MOS in 2022 at 81,77, with a slight decrease from the previous year, and a nearly unchanged unfavorable MOS of -25,32. This stability indicates consistent positive media exposure and effective crisis management, leading to a "Robust" net MOS of 56,45. The minor drop from "Excellent" to "Robust" could reflect market dynamics or increased competition. In 2023, NOS's favorable MOS declined to 67,91, and the unfavorable MOS rose slightly to -34,26. Despite these changes, the brand maintained a "Robust" net MOS of 33,66, suggesting that NOS continued to handle its media presence effectively amidst a slightly more challenging environment. The brand's ability to sustain a positive net score highlights ongoing stability and resilience.

Vodafone's MOS scores reveal a challenging trajectory marked by significant setbacks, particularly in 2022, and efforts to rebuild its media presence by 2023. In 2021, Vodafone's favorable MOS was 33,65, suggesting a decent level of positive media

coverage, perhaps from ongoing business activities or customer service improvements. The low unfavorable MOS of -8,91 indicates minimal negative press, resulting in a "Moderate" net MOS of 24,74. This balanced score reflects a stable but not particularly strong media presence. The year 2022 was particularly tough for Vodafone, with a favorable MOS of 40,97 outweighed by a much higher unfavorable MOS of -45,11. This net negative score (-4,14, "Vulnerable") resulted primarily from a major cyberattack that disrupted services and led to widespread negative coverage, coupled with regulatory issues requiring customer refunds. This stark contrast highlights the significant impact of these challenges on the brand's media presence. In 2023, Vodafone showed signs of recovery, with an unfavorable MOS improving to -20,92 and a favorable MOS of 35,71. This improvement led to a net MOS of 14,79, categorized as "Moderate." The reduction in negative press reflects efforts to manage the fallout from previous crises and rebuild the brand's reputation. Although still moderate, the improvement from 2022 indicates a positive trajectory towards stability.

The breakdown of the MOS into favorable and unfavorable components provides several advantages for understanding brand performance:

- Clearer Insight into Media Dynamics: By examining both favorable and unfavorable scores, stakeholders can better understand the specific factors contributing to a brand's overall media performance. A high favorable score with a similarly high unfavorable score reveals a brand with strong media presence but also significant challenges, as seen with Altice/MEO in 2023.
- Targeted Reputation Management: This approach helps brands identify areas for improvement. For example, Vodafone's recovery efforts are evident in the decrease in its unfavorable MOS in 2023, signaling effective crisis management and the beginning of a reputational rebound.
- Balanced Perspective on Media Impact: Instead of focusing solely on the net MOS, which can obscure the underlying dynamics of media coverage, the split approach reveals both strengths and vulnerabilities. This comprehensive view aids in crafting more targeted and effective communication strategies.
- Enhanced Strategic Planning: Understanding the balance between favorable and unfavorable coverage enables more strategic planning, allowing brands

to capitalize on their strengths while addressing areas of negative perception more directly.

Image 14

Monthly MOS during 2021

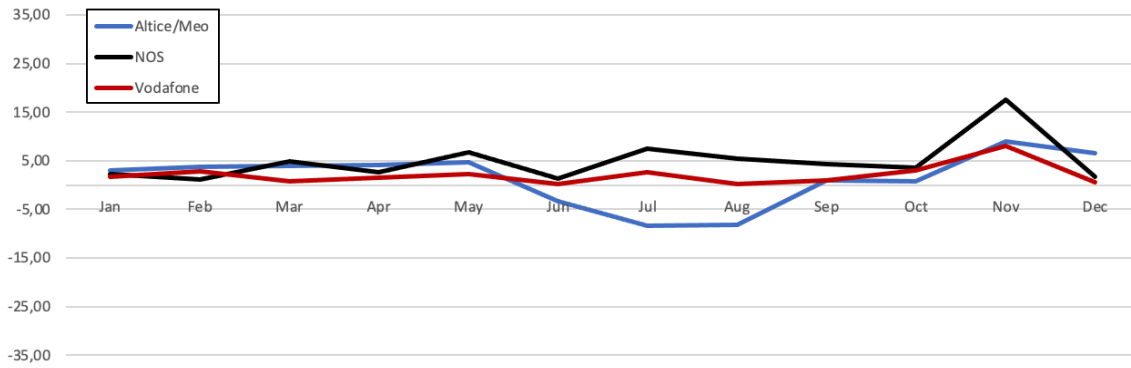


Image 15

Monthly MOS during 2022

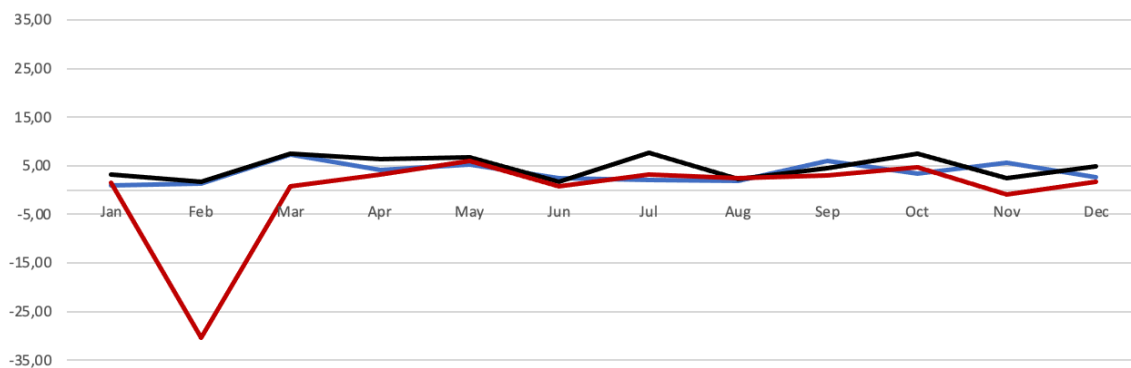
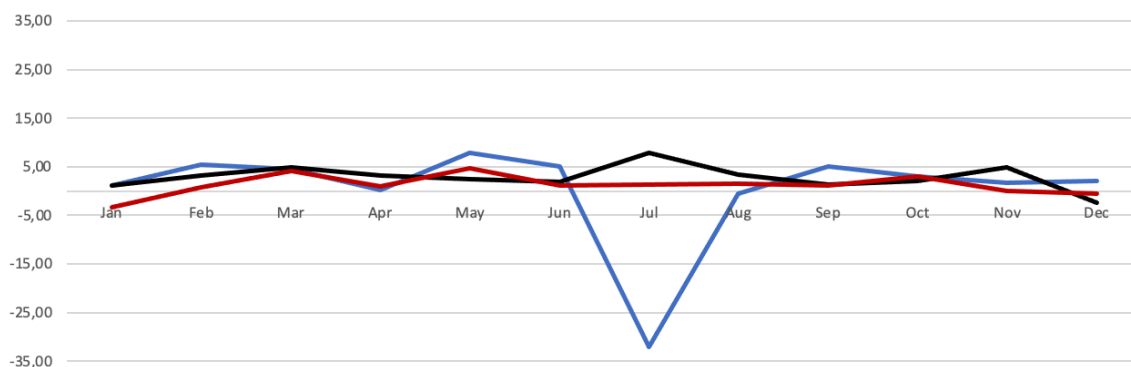


Image 16

Monthly MOS during 2023



Narrowing down the analysis to shorter time periods, images 14, 15 and 16 show graphs with the trends month by month over the period analyzed.

The year trends graphics illustrate the monthly performance of the three brands from 2021 to 2023, revealing significant fluctuations that align with notable events during this period. The Media Output Score, in particular, demonstrates a pronounced ability to capture and reflect both positive and negative trends for each brand, as evidenced by the peaks and troughs throughout the timeline.

In July and August 2021, Altice/MEO experienced a marked decline in performance, a dip that corresponds with two critical events. Firstly, the announcement of a collective dismissal led to widespread unrest, with unions organizing various forms of protest, including a strike on July 22. This labor unrest likely generated negative media coverage, contributing to the downturn observed in the graph. Concurrently, Altice was implicated in a legal investigation by the Public Prosecutor's Office concerning a TV contract deal with FC Porto, further exacerbating the negative sentiment and amplifying the brand's unfavorable media output during this period. The sharp dip in the Media Output Score during these months effectively captures the brand's struggles to manage these crises and the resultant negative public perception.

November 2021 saw a distinct peak for NOS, driven by several positive developments. The expansion of the 5G network, alongside the launch of a fund for 5G startups, generated significant positive media attention. This was compounded by the release of robust financial results, with NOS reporting profit growth of nearly 52%. The broader context also saw all three brands—NOS, Altice/MEO, and Vodafone—announcing favorable financial results and the awarding of 5G rights by Anacom. These developments collectively fostered a wave of positive sentiment, particularly benefiting NOS, as evidenced by the surge in the graph. The Media Output Score for NOS during this period clearly reflects its capacity to amplify and sustain the positive coverage and public sentiment generated by these strategic and financial successes.

February 2022 marked a sharp downturn for Vodafone, reflecting the impact of a significant cyber incident. A major computer attack on Vodafone disrupted services and attracted negative media scrutiny, further compounded by the company's subsequent announcement to refund customers who were charged for unsolicited additional services. This incident significantly damaged Vodafone's public perception and media output, resulting in a notable dip in the graph for this period. The Media Output Score

here underscores Vodafone's vulnerability to negative events and its struggle to counteract the adverse publicity and customer dissatisfaction arising from this crisis.

In July 2023, Altice/MEO faced another severe setback, as reflected by a sharp decline in the graph. This downturn was precipitated by a series of raids on the company and its founder, Armando Pereira, under suspicion of corruption and tax fraud. The subsequent arrest of Pereira intensified the negative media coverage, severely impacting the company's reputation and public perception. The gravity of these allegations and the resulting legal proceedings likely contributed to the steep decline in Altice/MEO's performance during this time. Once again, the Media Output Score reveals its ability to sharply track this negative trend, reflecting the brand's struggles in maintaining a positive public image amidst severe legal challenges.

Overall, the graph underscores the profound impact of external events on the performance and public perception of these brands, with the Media Output Score proving to be a highly responsive metric to both positive and negative trends. Positive developments, such as financial growth and strategic investments, correlate with peaks in the graph, reflecting increased media attention and favorable public sentiment. In contrast, negative events, including legal troubles, labor unrest, and cyber incidents, correspond with sharp declines, highlighting the brands' vulnerabilities and the importance of effective crisis management and strategic communication to mitigate such impacts. The Media Output Score's sensitivity to these fluctuations provides a valuable insight into each brand's ability to navigate and respond to the ever-changing landscape of public perception and media coverage.

The table 17 presents the Media Output Score (MOS) for Altice/MEO, NOS, and Vodafone across the media outlets selected for this study dataset, revealing the influence and reach of each brand within different editorial landscapes.

Table 17

Media Output Score by Media Outlet

<i>Media Outlets</i>	<i>Altice/MEO</i>	<i>NOS</i>	<i>Vodafone</i>
<i>Dinheiro Vivo</i>	6,86	8,90	6,39
<i>ECO - Economia</i>	13,41	23,27	10,42
<i>Executive Digest</i>	7,77	8,71	6,23
<i>Expresso</i>	-12,52	20,68	6,83
<i>Jornal Económico</i>	5,06	20,07	4,00
<i>Negócios</i>	0,92	20,27	9,82
<i>Notícias ao Minuto</i>	-1,10	5,07	1,43
<i>Observador</i>	-7,06	7,74	-5,92
<i>RTP</i>	-3,39	11,38	-4,11
<i>Sapo</i>	53,99	21,42	1,08

The data per media outlet clearly highlights how each brand's media reputation varies depending on the outlet, with notable differences in the coverage they receive.

Altice/MEO shows a particularly strong performance in the media outlet "Sapo," where it has an exceptionally high MOS of 53,99. This significant score is markedly higher than that of NOS (21,42) and Vodafone (1,08). This disparity can be largely attributed to the fact that Altice owns Sapo, giving the company substantial leverage to influence editorial alignment and shape the narrative in its favor. As a result, Sapo consistently publishes more positive stories about Altice/Meo, enhancing its media reputation relative to its competitors. This strategic use of a media asset to cultivate a favorable public image is evident in the substantial gap in MOS between Altice/Meo and the other brands within this outlet. The deliberate use of Sapo by Altice/Meo directly impacts the conclusions of this study regarding media reputation based on media coverage. The significantly positive coverage by Sapo skews the overall perception of Altice/Meo's reputation, suggesting a more favorable standing than might otherwise be the case. Without the disproportionately high MOS provided by Sapo, Altice/Meo's media

reputation would likely be considerably less favorable when compared to its competitors.

In contrast, Altice/Meo's performance in other media outlets is mixed and often less favorable. For instance, in "Expresso," Altice/Meo has a negative MOS of -12,52, while NOS boasts a much higher score of 20,68, and Vodafone has a modest score of 6,83. This suggests that "Expresso" tends to be more critical of Altice/Meo, while it portrays NOS in a more favorable light. Similar patterns are observed in outlets like "Jornal Económico" and "Negócios," where NOS consistently scores higher than Altice/Meo, indicating a preference or more favorable editorial stance towards NOS in these publications.

Vodafone, on the other hand, generally records lower MOS across most media outlets compared to NOS and, in some cases, Altice/Meo. The scores are particularly low in outlets such as "Observador" (-5,92) and "RTP" (-4,11), suggesting less favorable coverage or possibly more critical reporting. However, Vodafone does show a relatively positive performance in "Dinheiro Vivo" (6,39) and "Executive Digest" (6,23), where the MOS is comparable to that of Altice/Meo and NOS, indicating a more balanced or neutral editorial stance towards the brand in these media.

NOS emerges as the brand with the most consistent and positive media coverage across a variety of outlets. It records high MOS values in several key publications such as "ECO - Economia" (23,27), "Expresso" (20,68), "Jornal Económico" (20,07), and "Negócios" (20,27). This widespread favorable coverage suggests that NOS has managed to maintain a strong media presence and positive reputation across diverse editorial landscapes. The consistently high scores in these influential outlets reflect effective media relations and a successful strategy in managing its public image.

The advantage of analyzing MOS split by media outlets is that it provides communication professionals with valuable insights to align their strategies on a media-by-media basis. Understanding where each brand stands with different media allows them to identify which outlets they need to engage with more closely to influence coverage more effectively. For instance, Altice/Meo might recognize the need to work more on relationships with outlets like "Expresso" and "Observador," where their scores are notably lower, while NOS and Vodafone might focus their efforts on media where their coverage is less favorable. This targeted approach enables brands to

strategically improve their media relations and optimize their public perception in a more nuanced and effective manner.

Overall, the table highlights the strategic use of media outlets by each brand to influence public perception. Altice/Meo's exceptionally high score in "Sapo" underscores its ability to leverage owned media to enhance its reputation. This use of Sapo significantly influences the overall findings of this study regarding Altice/Meo's media reputation, portraying it in a more favorable light than might be the case if Sapo's influence were excluded. Without Sapo's positive skew, Altice/Meo would likely find itself in a more challenging position compared to its competitors, NOS and Vodafone. Meanwhile, NOS's robust performance across multiple outlets suggests a broad base of positive media coverage, while Vodafone's varied performance indicates a need for improved media strategy in certain outlets. The Media Output Scores thus provide valuable insights into the editorial alignment and media influence strategies employed by each brand to shape their public narratives, enabling them to refine their communication strategies and strengthen their market positions.

In an article by article analysis, MOS allows you to demonstrate the relevance of each news item compared to the others, which is very useful to have an immediate perception of the impact of an individual news item. Through the multiplication of the absolute value that results from the quantitative formula by the defined qualitative weights, news of neutral or balanced favorability results in a 0 MOS, which makes the neutral/balanced effect nullified in terms of media coverage value.

Table 18

Comparing MOS and its foundation metrics for the article with highest and lowest MOS

<i>Lowest MOS -1,07</i>	<i>Highest MOS +1,42</i>
<i>Media Outlet: Observador</i>	<i>Media Outlet: Sapo</i>
<i>Date: 15.7.2022</i>	<i>Date: 25.2.2022</i>
<i>Headline: Cartão Vermelho. MP também investiga Porto, família Pinto da Costa e empresa Altice/MEO</i>	<i>Headline: MEO oferece chamadas gratuitas para a Ucrânia e acesso à Ukrainian TV</i>
<i>Brand:Altice/MEO</i>	<i>Brand: Altice/MEO</i>
<i>Prominence: 3</i>	<i>Prominence: 3</i>
<i>Tone: -1,04</i>	<i>Tone: 0,98</i>
<i>Readership: 4746</i>	<i>Readership: 8923</i>
<i>Readership after targeting: 4271</i>	<i>Readership after targeting: 3569</i>
<i>Engaged: 2650</i>	<i>Engaged: 3982</i>

Comparing the news item with the highest MOS with the news item with the lowest MOS in the study (Table 18), it is possible to understand:

- The influence of favorability in determining a negative or positive MOS
- The weight given to the negative articles is greater than the positive articles and the influence in the favorability metric.
- The pre-classification weight of the media outlets according to their relevance to the industry. The difference between verified readership and readership after targeting depending on the context and objective of the communication, we see that Observador, despite having lower readership than Sapo, has more influence on telecommunications decision-makers in Portugal, so the readership after targeting that underpins MOS role is higher.
- The prominence, readership, and engagement achieved and their positive or negative tone-dependent determination.

4.4. Comparison between Media Output Score and Reputation Score using the first case study: Telecommunications Sector in Portugal between 2021 and 2023

The relationship between media reputation and communication has been extensively explored in the literature, demonstrating the media's powerful role in shaping public perception and corporate reputation. Media outlets influence stakeholder evaluations by controlling both the dissemination and framing of information, commonly referred to as "media reputation" (Deephouse, 2000; Carroll & McCombs, 2003). However, media coverage is not the only determinant of corporate reputation. Factors such as direct stakeholder interactions, corporate actions, and product or service quality also play crucial roles (Rindova et al., 2005; Fombrun & Shanley, 1990). Stakeholders often form their opinions based on a combination of media portrayal and their own experiences with the brand or company (Bitektine & Haack, 2015). Thus, while media has a significant impact, the broader network of stakeholder interactions and corporate behavior must be considered when analyzing reputation dynamics.

In order to check whether there is a linearity between the Media Output Score, the metric we proposed to evaluate the media reputation of each brand studied, and the respective reputation score attributed to each brand, we made a direct comparison between the MOS and the Reputation Score of each brand in each year analyzed (Table 19).

Table 19

Comparing Media Output Score (MOS) with Reputation Score (RepScore) for Altice, Meo, NOS and Vodafone from 2021 to 2023

<i>Brands</i>	<i>2021</i>		<i>2022</i>		<i>2023</i>	
	<i>MOS</i>	<i>RepScore</i>	<i>MOS</i>	<i>RepScore</i>	<i>MOS</i>	<i>RepScore</i>
<i>Altice</i>	12,72	67,3	36,98	68,4	1,78	69,8
<i>Meo</i>	5,72	75,7	17,32	75,7	16,72	77,2
<i>Nos</i>	59,04	73,1	56,45	73,6	33,66	76,3
<i>Vodafone</i>	24,74	74,3	-4,14	75,1	14,79	76,5

Table 20*Interpretative scale for MOS and RepScore*

Rating	MOS	RepScore
Excellent	MOS > 59	Rep Score >80
Robust	between 30 and 58	between 70 and 79
Moderate	Between 0 and 29	between 60 and 69
Vulnerable	Between -1 and -65	between 40 and 59
Weak	MOS < -66	RepScore < 39

The comparative analysis between the Media Output Score (MOS) and RepScore for the four brands—Altice, Meo, NOS, and Vodafone—over the period from 2021 to 2023 provides valuable insights into the relationship between media coverage and public perception. The MOS represents media reputation based on media coverage performance, reflecting how frequently and favorably each brand is discussed in various media outlets. In contrast, the RepScore is derived from public surveys and indicates public reputation, offering a different perspective on how these brands are perceived by the general population. Despite using different scales—MOS being an infinite scale ranging from negative to positive infinity, and RepScore being a finite scale from 1 to 100—it's possible to draw meaningful interpretations based on the interpretative table and focus in the Rating for MOS and for RepScore (Table 20). Although these two metrics are derived from different scales, the key is to align their respective rating systems in order to facilitate meaningful comparison. To compare the MOS with the RepScore, an interpretative rating system was employed to align the two scales, even though they are based on different metrics. The key idea is that the ratings—Excellent, Robust, Moderate, Vulnerable, and Weak—hold equivalent meaning across both MOS and RepScore, allowing for a meaningful comparison between media performance and corporate reputation. For instance, an "Excellent" rating corresponds to a MOS greater than 59 and a RepScore greater than 80, reflecting top-tier performance in both media coverage and reputation. Similarly, a "Robust" rating is achieved when MOS is between 30 and 58, and RepScore falls between 70 and 79, indicating solid performance across both metrics. A "Moderate" rating (MOS between 0 and 29, RepScore between 60 and 69) represents a satisfactory but not outstanding level of performance. Meanwhile, a

"Vulnerable" rating (MOS between -1 and -65, RepScore between 40 and 59) signals a precarious position for both media performance and reputation, while a "Weak" rating (MOS below -66, RepScore below 39) indicates significant challenges in both areas. This approach is not uncommon in research where different scales are used to measure related constructs, as the interpretative alignment of scores allows for coherent comparisons across diverse metrics. Several studies in the field of organizational research have successfully employed interpretative scales to align different measurement systems. For example, in cross-disciplinary analyses, different scales for financial performance and brand reputation have been aligned using common interpretative categories (Fombrun & Shanley, 1990; (Rindova et al., 2005). Similarly, Deephouse (2000) aligned media favorability and corporate reputation using distinct but comparable scales by focusing on their relative positions within predefined interpretative categories. These methodologies validate the use of interpretative scales as a robust approach for drawing comparisons between different measurement models, ensuring that the focus remains on the meaning of the scores rather than the exact numeric alignment.

Across the board, the trends observed highlight that while media coverage, as reflected in MOS, can influence reputation, the relationship is not always direct or immediate. For example, Altice's experience shows that the reputation response to negative media coverage can be delayed or muted. This phenomenon is well-supported in the literature. Research by Fombrun & Shanley (1990) suggests that corporate reputation is a long-term asset, often resilient in the face of short-term negative media coverage. Companies with strong reputational capital, built over years of positive performance and stakeholder trust, can withstand temporary negative publicity without an immediate decline in reputation. Stakeholders may require prolonged or repeated exposure to negative signals before adjusting their perceptions, especially if the company has historically maintained a strong reputation. Additionally, Rindova et al. (2005) emphasize the "stickiness" of reputation, meaning that once a company's reputation is established, it can be resistant to change. This explains why even significant media criticism may not cause an immediate reputational hit if the company's prior actions have created a strong positive image. Stakeholders, including decision-makers, may be slow to react, awaiting further evidence or consistent negative performance before modifying their assessment of the company. Furthermore, Deephouse (2000) notes that

media visibility, while influential, does not act in isolation. The framing of media coverage, stakeholder perceptions, and the company's historical reputation management efforts can mitigate the immediate impact of negative press. In Altice's case, this suggests that stakeholders might be weighing the negative coverage against the company's broader track record, leading to a delayed or muted reputational response unless the negative coverage persists or aligns with other deteriorating factors. In 2021, Altice faced significant negative media coverage due to incidents such as labor unrest and legal investigations, resulting in a "Moderate" MOS of 12,72. Despite this, its RepScore remained relatively stable at 67,30, also within the "Moderate" range. This suggests that public perception is shaped by a combination of factors, including the brand's history, customer experience, and internal communications strategies, rather than media coverage alone. Even as Altice's MOS fluctuated due to various challenges and recoveries, the RepScore showed a more gradual change, indicating that reputation is often influenced by more enduring elements.

Meo's consistently strong public reputation, despite moderate media challenges, underscores the importance of customer-centric strategies in maintaining a favorable public image. Meo's MOS ranged within the "Moderate" category across the three years, yet its RepScore remained robust, increasing from 75,70 in 2021 to 77,2 in 2023. This stable and positive public perception suggests that customer engagement and satisfaction are critical factors that can help mitigate the impact of less favorable media coverage, allowing a brand to sustain a strong reputation even amidst fluctuating media sentiment.

Vodafone's experience emphasizes the critical role of crisis management in protecting and enhancing reputation, even when media coverage is overwhelmingly negative. In 2022, Vodafone's MOS plummeted to -4,14, placing it in the "Vulnerable" category due to a major cyberattack and resulting negative press. However, the RepScore only slightly dipped to 75,1, remaining within the "Robust" range. This resilience in public perception suggests that effective crisis management and proactive communication can significantly mitigate the negative effects of adverse media coverage. The slight recovery in both MOS and RepScore by 2023 further illustrates how strategic actions during a crisis can rebuild trust and enhance reputation over time.

NOS presents a different dynamic, where strong media performance did not always lead to proportionate gains in public reputation. In 2021, NOS achieved an "Excellent" MOS

of 59,04, reflecting highly favorable media coverage, and a "Robust" RepScore of 73,1. While both metrics indicate a strong position, the RepScore showed only modest increases over time, suggesting that while media success is important, it must be complemented by other strategic efforts such as customer engagement and innovative offerings to drive significant improvements in public reputation. By 2023, despite a decline in MOS to 33,66, NOS's RepScore had increased to 76,3, indicating that public perception remained robust even as media coverage became less favorable, highlighting the need for a holistic approach to reputation management.

These trends underscore that while MOS, representing media reputation based on media coverage performance, is a valuable indicator, it is not the sole determinant of public perception as reflected in RepScore. Altice's situation shows that the impact of negative media on reputation can be gradual, shaped by enduring brand qualities and sustained communication efforts. Meo's robust public reputation, despite moderate media scores, highlights the importance of a customer-focused approach in maintaining a strong public image. Vodafone's management of the 2022 cyberattack demonstrates the power of effective crisis management in safeguarding reputation, proving that actions speak louder than words in shaping long-term public sentiment. Meanwhile, NOS's experience illustrates that while strong media coverage is beneficial, it must be part of a broader strategy to enhance public reputation effectively.

The analysis of the MOS and RepScore over the three-year period suggests that a balanced approach—encompassing media engagement, customer service excellence, effective crisis management, and long-term strategic planning—is essential for sustaining and enhancing brand reputation in the competitive telecommunications industry. The differences in scales between MOS and RepScore, despite allowing for different interpretations, provide a comprehensive view of both media reputation and public perception. This understanding is crucial for brands looking to navigate the complexities of modern reputation management and maintain a favorable standing in both the media and the public eye.

4.5 Key Findings from the second case study: Food Retail brands in Portugal during the year 2023

To further validate the developed artifact beyond the telecommunications sector, we applied the same model to the largest food retail brands in Portugal. This application focuses on a preliminary analysis, aiming to verify the consistency of the Media Output Score and its alignment with the underlying metrics. Additionally, we assess whether the results reflect the activity trends within this sector during 2023. Ultimately, we compare the reputation scores of these brands to evaluate the potential linearity with the MOS, thereby exploring the model's versatility across different industries.

Between January 1st, 2023 and December 31st, 2023, a total of 18196 records of references to these brands were identified and distributed as follows:

- Auchan, 2445 mentions;
- Continente, 5906 mentions;
- Lidl, 2878 mentions;
- Mercadona, 2451 mentions;
- Pingo Doce, 4516 mentions;

For the case study, the 11 online media outlets that carried the most news about the analyzed brands were selected to be the sample. The final dataset resulted in a total of 4016 records, 669 with reference to Auchan, 1181 with reference to Continente, 739 with reference to Lidl, 670 with reference to Mercadona and 757 with reference to Pingo Doce. These news items registered a total of 262208 interactions on Facebook, divided into 39013 comments, 169464 likes and 53761 shares.

The target geographic scope of the study, considering the Food Retail industry target, was defined as the Portuguese population over 14 years of age, in a total universe of 8988124 individuals. The brand's communication goals were defined as contact with the target population, and weights were assigned to the media, considering their ability to influence the target population, particularly regarding decision makers for the choice of a retail food brand in Portugal. The attribution of weights for food retail brands was determined by a communication analysis specialist, based on each media outlet's credibility, influence, and ability to drive decision-making, particularly among key stakeholders in the retail industry. Credible outlets with strong reach and the capacity to

communicate effectively with both general consumers and industry decision-makers were prioritized to ensure the MOS accurately reflects media performance and its impact on strategic brand decisions (Kioussis, 2001; McCombs & Reynolds, 2002).

Table 21

Data from the media analyzed for food retail industry and respective weights

Media Outlet	Number of articles	Daily visitors	Pages per visit	Average daily articles	Readership	Weight for Food Retail	Food Retail readership
NiT New in Town	974	243333	2,17	47	11235	100%	11235
ECO - Economia	386	143501	1,69	75	3234	70%	2263
Grande Consumo	369	1516	1,5	7	325	100%	325
Notícias Minuto	358	960371	1,92	434	4249	100%	4249
Hipersuper	342	983	1,5	6	246	100%	246
Marketeer	341	7610	1,56	18	660	80%	528
Echo Boomer	335	3863	1,46	17	332	100%	332
Distribuição Hoje	230	950	1,49	2	708	100%	708
Versa	229	13166	1,37	22	820	100%	820
Negócios	226	210261	2,03	70	6098	70%	4268
Sapo	226	282086	4,65	422	3108	100%	3108

In 2023, the Portuguese retail food market experienced significant shifts, with leading brands adapting to a highly competitive environment. The sector is characterized by intense rivalry among well-established players and newcomers, all striving to capture consumer attention through strategic communication efforts and product differentiation.

By analyzing key performance indicators of food retail brands in 2023, such as Frequency, Share of Voice (SOV), Readership on Target, Engagement, Favorability, and the Media Output Score (MOS) in Table 22, we can gain a comprehensive understanding of how these foundational metrics interrelate and contribute to the overall effectiveness of each brand's media presence. This analysis allows us to dissect the intricate ways in which each metric impacts the MOS, offering insights into the strengths and areas for improvement in their communication strategies.

Table 22

Key Performance Indicators with MOS and its foundation metrics using the food retail case study dataset

Brands	Frequency	Share of Voice	Readership on target	Engaged	Avg Favorability	Media Output Score	
Auchan	669	16,66%	2395897	28034	0,62	27,35	Moderate
Continente	1181	29,41%	4548815	53027	0,69	70,41	Excelent
Lidl	739	18,40%	2595695	42438	0,76	57,17	Robust
Mercadona	670	16,68%	3233096	91952	0,81	98,12	Excelent
Pingo Doce	757	18,85%	3076479	46757	0,48	29,29	Moderate

In 2023, the Media Output Score (MOS) results provide a nuanced view of how major retail brands in Portugal have managed their media presence and audience engagement. Mercadona stands out with the highest MOS of 98,12, classified as "Excellent." This exceptional score is achieved despite having a smaller Readership on Target compared to its competitor Continente. The key to Mercadona's success lies in its superior Favorability Score of 0,81 and its exceptionally high Engagement level. These figures highlight that Mercadona's communication strategy effectively resonates with its audience, generating a positive public perception and significant interaction. The brand has successfully balanced its media strategy by prioritizing quality engagement and fostering a strong connection with consumers. This suggests that the impact of media coverage is not just about reaching a broad audience, but also about the nature of the engagement and the positivity of the sentiment it generates.

In contrast, Continente, which boasts the highest Frequency and Share of Voice (SOV) at 29,41%, has a slightly lower MOS of 70,41. Although Continente reaches a larger audience with the highest Readership on Target, its Favorability Score of 0,69 is lower than Mercadona's. This indicates that while Continente's communication efforts effectively maintain a dominant market presence, the impact of its media coverage is somewhat moderated by the less favorable sentiment. The case of Continente demonstrates that a broad media reach and high frequency do not automatically translate into higher engagement or sentiment, both of which are crucial components for enhancing the MOS.

Lidl, with a MOS of 57,17, offers an example of how a brand can achieve a strong media impact through quality engagement rather than sheer volume. Despite having a moderate Frequency of 739 and a SOV of 18,40%, Lidl's high Favorability Score of 0,76 and significant engagement reveal that its media strategy has been successful in connecting with its audience. Lidl's communication efforts focus on fostering positive sentiment and engaging its target audience, allowing it to maintain a robust MOS even without dominating media presence. This underlines the importance of quality over quantity in media strategies, demonstrating that a brand can significantly enhance its media impact by prioritizing positive coverage and engagement.

Auchan and Pingo Doce, on the other hand, have a "Moderate" MOS, with scores of 27,35 and 29,29, respectively. Auchan's Frequency is 669 with a SOV of 16,66%, and Pingo Doce has a Frequency of 757 and a SOV of 18,85%. Their respective Readership on Target indicates that they reach a considerable audience. However, their lower Favorability Scores and relatively low engagement levels suggest that their media presence does not resonate as effectively with their audience. The moderate MOS scores of these brands highlight the need for more strategic media engagement that fosters positive perceptions and encourages audience interaction. Their cases illustrate that to enhance MOS, it is not enough to simply be present in the media; brands must actively cultivate positive sentiment and engagement.

The analysis of the MOS across these brands underscores that a brand's media impact is significantly shaped by the quality of its media coverage, the sentiment it evokes, and the level of audience engagement it generates. Mercadona exemplifies how a balanced media strategy that prioritizes positive sentiment and high engagement can lead to an excellent MOS, even with a smaller readership compared to competitors like Continente. Similarly, Lidl demonstrates that a focus on quality engagement can yield a robust media impact, underscoring that it is not the quantity of media coverage that matters most, but the resonance and interaction it creates. On the other hand, Auchan and Pingo Doce's moderate MOS scores reveal the importance of improving both media tone and audience engagement to achieve a more impactful media presence. Therefore, to achieve a higher MOS, brands should aim for media coverage that not only reaches a broad audience but also resonates positively with that audience and fosters active engagement.

4.6. Comparison between Media Output Score and Reputation Score for the second case study: Food Retail brands in Portugal from 2021 to 2023

To check whether there is a linearity between the Media Output Score and the respective reputation score attributed to each brand, we made a direct comparison between the MOS and the Reputation Score of each brand in 2023. (Table 22).

Table 23

Comparing Media Output Score (MOS) with Reputation Score (RepScore) for Auchan, Continente, Lidl, Mercadona and Pingo Doce

Brands	Media Output Score		Reputation Score	
Auchan	27,35	Moderate	74,2	Robust
Continente	70,41	Excelent	80,5	Excelent
Lidl	57,17	Robust	80,6	Excelent
Mercadona	98,12	Excelent	76,3	Robust
Pingo Doce	29,29	Moderate	78,1	Robust

The comparison between the Media Output Score (MOS) and RepScore for major food retail brands in 2023 provides nuanced insights into the relationship between media coverage and overall reputation. While both scores aim to capture different aspects of a brand's public perception, they do not always align in a linear fashion, indicating that a brand's reputation is influenced by a complex interplay of factors.

The alignment between Continente's 'Excellent' MOS and its 'Excellent' RepScore suggests a possible relationship between its strong media presence and positive public reputation. While the brand's effective media strategy likely plays a role in reinforcing its market dominance and shaping public opinion, it is important to recognize that other factors, such as product quality and customer satisfaction, may also significantly contribute to its high reputation score.

Lidl presents a case where the RepScore of 80,6 ("Excellent") slightly exceeds the MOS of 57,17 ("Robust"). This divergence implies that while Lidl has a robust media presence, its reputation is even more favorable in the public domain. This disparity can be attributed to factors beyond media coverage, such as its emphasis on product quality,

customer service, and sustainable practices, which resonate with consumers and enhance its reputation.

Conversely, Mercadona showcases an "Excellent" MOS of 98,12, the highest among the brands, but a slightly lower RepScore of 76,3 ("Robust"). This suggests that despite a highly effective media strategy that garners significant engagement and positive sentiment, other elements influencing public perception may not be as strong. Factors such as customer experiences, corporate practices, or market positioning could account for the lower RepScore relative to its media coverage.

Auchan and Pingo Doce both exhibit moderate MOS scores of 27,35 and 29,29, respectively, yet their RepScores are relatively high, with Auchan at 74,2 and Pingo Doce at 78,1, both classified as "Robust." This indicates that despite a less impactful media presence, these brands maintain a solid reputation in the public eye. Such a finding suggests that reputation is shaped by a broader set of variables beyond media performance, including customer loyalty, operational strengths, and possibly pricing and service quality. These brands' ability to sustain a robust reputation despite moderate media impact highlights the multifaceted nature of reputation management.

Overall, the analysis indicates that while there is some degree of correlation between MOS and RepScore, the relationship is not strictly linear. The data suggests that media coverage plays an important role in shaping public perception, but it is not the only factor. Reputation encompasses a wider range of influences, including direct customer experiences, perceived value, and corporate conduct. Therefore, brands must consider a holistic approach to reputation management that goes beyond media engagement to encompass various dimensions of consumer interaction and satisfaction. This complexity underscores the need for a multi-faceted strategy in managing and enhancing brand reputation.

4.7 Discussion of the results

The goal of this research is to develop and validate a new metric, the Media Output Score, designed to provide a comprehensive evaluation of digital media coverage performance by integrating both quantitative and qualitative variables. Unlike traditional vanity metrics, the MOS aims to offer a more accurate and meaningful measure of media performance.

MOS demonstrates to be a sophisticated metric that captures both the volume (visibility) and quality (favorability) of media coverage, as well as audience engagement (social amplification) and targeted reach (readership after targeting). The MOS reflects a holistic understanding of media performance by considering how media coverage aligns with the brand's communication objectives and its impact on the target audience. By incorporating both quantitative data such as readership and engagement metrics and qualitative assessments such as sentiment and tone, the MOS provides a more accurate and meaningful measure of media coverage impact, enabling businesses to make more informed decisions and develop effective communication strategies.

The telecommunications case study focused on the digital media coverage of Altice/Meo, NOS, and Vodafone in Portugal's top ten digital media outlets from 2021 to 2023. The Media Output Score was calculated using various foundational metrics, including the frequency of articles, share of voice (SOV), readership on target, engagement (e.g., social media interactions), and favorability (e.g., sentiment analysis of the news). By combining these elements, the MOS provides a multifaceted view of a brand's media coverage performance. The MOS integrates both quantitative metrics like frequency of articles, SOV, readership, and engagement and qualitative metrics favorability or sentiment of coverage, allowing for a more nuanced evaluation of media performance. This combination is vital because it reflects not only the volume of media coverage but also the nature of that coverage. For example, in 2022, Vodafone's MOS plummeted to -4,14, indicating a vulnerable media presence, mainly due to a significant cyberattack and subsequent negative press. This decline was not just about the number of articles but also the negative sentiment they carried, which the MOS effectively captured.

The MOS is highly sensitive to shifts in media coverage, particularly during crises or recoveries. For instance, Altice/Meo's MOS rose sharply in 2022 to 42,83 from a moderate score of 17,01 in 2021, reflecting successful efforts to manage media reputation following negative incidents like labor disputes and legal investigations. However, the MOS fell again in 2023 to 2,90 due to renewed negative coverage from the arrest of Altice co-founder Armando Pereira on corruption charges. The ability of the MOS to fluctuate with these developments demonstrates its capacity to reflect the real-time media landscape and its impact on a brand's image.

The MOS allows for a direct comparison of media performance across different brands and over various time periods. NOS consistently showed a robust to excellent MOS across the years, indicating a strong media presence and positive audience engagement. Meanwhile, Vodafone's MOS showed a decline in 2022, reflecting a period of crisis, but demonstrated a recovery in 2023. This comparative capability makes the MOS a valuable tool for benchmarking performance and strategizing future media engagements. One of the standout features of the MOS is its ability to account for favorability, which can significantly impact a brand's overall media performance. The case study highlighted that while Altice/Meo had a relatively high frequency of articles and share of voice, its low favorability scores in certain years resulted in a lower MOS. Conversely, NOS maintained a high MOS by consistently achieving positive media sentiment, even when other metrics fluctuated. This insight is crucial for brands looking to understand not just how much they are being talked about, but how they are being perceived.

The MOS is also a practical tool for informing strategic decisions. For example, the clear decline in Vodafone's MOS in 2022 due to a cyberattack and negative press coverage could prompt the company to invest more in cybersecurity measures and crisis management strategies to protect and enhance its media reputation. Similarly, the stability of NOS's MOS suggests effective media and public relations strategies, which could serve as a model for other brands seeking to improve their media performance.

Using the food retail case study, MOS has also demonstrated its efficacy as a metric that accurately captures the dynamics of media coverage. This metric not only reflects the frequency and reach of media mentions but also provides insight into the quality and impact of the coverage, effectively representing the interaction between media presence and public perception.

For industries, the MOS serves as a strategic barometer, measuring the effectiveness of media performance across key metrics like visibility, favorability, and engagement. This early-warning system enables brands to be proactive, making adjustments to campaigns or public messaging based on real-time feedback rather than waiting for more delayed and costly consequences. In fast-moving industries where public perception can shift rapidly, this ability to test and adapt communications strategies almost instantly is invaluable, offering a clear competitive advantage. Ultimately, the MOS helps organizations stay agile, ensuring their communication efforts remain aligned with their

broader strategic objectives and allowing them to mitigate potential crises before they fully develop.

These findings demonstrate that MOS is a comprehensive and effective tool for measuring digital media coverage, combining brand objectives, media targeting, visibility, favorability, readership, and social amplification into a single, multidimensional metric. The MOS provides a more nuanced understanding of media performance than traditional metrics like Advertising Value Equivalency (AVE), offering a more reliable measure that aligns with strategic communication goals and audience impact. What sets MOS apart from other metrics, including those such as Zhang's (2014) model, is its integration of audience targeting, social amplification and incorporating differentiated weighting for positive and negative articles, which are increasingly critical in today's media landscape. While Zhang's model focuses primarily on visibility and sentiment, it lacks the ability to measure whether the media coverage is reaching the intended audience or whether the content is being amplified through social networks. Research highlights the importance of aligning media coverage with specific audience segments to maximize strategic impact, especially in the context of digital and social platforms where content often spreads far beyond its original publication. Additionally, the weight of negativity in news consumption, as substantiated by other researchers and explained in the Methodology Chapter of this thesis, further underscores this need (Buhmann & Ingenhoff, 2015; Lovejoy & Saxton, 2012; Robertson et al., 2023). Moreover, industry tools like Newswhip, Brandwatch, and Meltwater—while valuable—lack the scientific rigor and comprehensive design of MOS. These tools tend to focus on isolated elements like article volume or sentiment, whereas MOS provides a holistic view of media performance by integrating audience targeting and social amplification alongside traditional metrics like visibility and sentiment. This makes MOS not only more aligned with strategic communication goals but also more actionable, allowing brands to adjust their media strategies in real time based on both quantitative and qualitative insights. MOS offers a more advanced, reliable, and actionable framework for measuring media coverage. By integrating elements like target audience alignment and social amplification, it surpasses traditional metrics like AVE and more narrow approaches like Zhang's (2014), providing communications professionals with a tool that is better suited to the complexities of today's media landscape.

4.7.1 Answer to the Investigation Questions

We set out on this investigation with two questions that we now seek to answer.

Q1: Can the output performance of digital media coverage of brands be measured using one artifact metric combining brand objectives, media targeting, visibility, favorability, readership, and social amplification?

Based on the analysis presented, we can conclude that the MOS metric is a comprehensive approach for measuring the online output performance of brands' digital media coverage, as it effectively combines brand objectives, media targeting, visibility, favorability, readership, and social amplification, providing a single metric that can be used to evaluate and compare the performance of brands in this context. MOS metric demonstrates consistency to combine the quantitative and qualitative performance of brands, bringing a combination between media performance and media reputation, offering a coherent and simple measure of media coverage performance, either news by news item, or in an integrated way for a set of news items.

The MOS addresses the limitations of traditional metrics such as AVE, providing a more holistic understanding of media coverage. By enabling businesses to make informed decisions and develop effective communication strategies, the Media Output Score can significantly contribute to brand management and public relations practices.

The regression analysis conducted as part of this study provides strong empirical support for the robustness of the MOS. The regression model demonstrated that the foundational metrics — Zscore(Media Visibility), Zscore(Engaged), Zscore(Readership), and Zscore(Favorability) — significantly contribute to the MOS. The R-squared value of 0.595 indicates that approximately 59,5% of the variability in the MOS can be explained by these independent variables. This high level of explained variance suggests that the combination of these metrics provides a robust measurement of digital media coverage performance. Each independent variable was statistically significant, with p-values less than 0,05, indicating that increases in media visibility, engagement, readership, and favorability are positively associated with an increase in the MOS. This confirms that these metrics are vital components in evaluating how well a brand is performing in the digital media landscape.

Q2: Can we establish a correlation between the Media Output Score and Reputation Score of brands?

The study reveals a nuanced relationship between the Media Output Score (MOS) and the Reputation Score (RepScore) of brands. While the MOS generally aligns with RepScore trends, indicating a correlation between media coverage and public reputation, the relationship is not always direct or immediate. For example, despite significant negative media coverage in 2021 and 2023, Altice/Meo's RepScore remained relatively stable. This suggests that reputation, as measured by RepScore, is influenced by factors beyond media coverage alone, such as customer experience, historical brand equity, and crisis management effectiveness. The MOS effectively captures the immediate impacts of media coverage, while the RepScore reflects more stable, long-term perceptions.

4.7.2 Conclusion on Hypothesis

H1: Measuring favorability, visibility, potential audience, and interaction through social networks of the news broadcast about a brand by the media on the internet are metrics that can be determined automatically and allow us to measure the media coverage of brands.

The research supports Hypothesis H1, demonstrating that favorability, visibility, potential audience, and social interaction metrics can be quantified and used effectively to measure the media coverage of brands. The regression analysis confirms that these metrics significantly contribute to the Media Output Score (MOS), validating their relevance in assessing digital media performance.

H2: Evaluating brands' digital media coverage makes it possible to compare their performance and extract insights from their results.

Hypothesis H2 is validated by the study. The MOS provides a robust comparative framework for evaluating and benchmarking digital media coverage performance across brands and over time. The case study analysis of Altice/Meo, NOS, and Vodafone highlights how the MOS can reveal distinct differences in media performance, offering actionable insights for strategic adjustments and improving media strategies.

H3: The results obtained when applying the new metric developed make it possible to establish an interrelationship between the media reputation of brands and their corporate reputation.

The results partially support Hypothesis H3. While the MOS provides valuable insights into media reputation and highlights media impact, the correlation with corporate reputation (RepScore) is complex and influenced by multiple factors. The study suggests that while the MOS reflects immediate media impacts, the RepScore captures more enduring aspects of reputation shaped by broader strategic and operational considerations.

4.7.3 Limitations and guidelines for future research

The MOS addresses the limitations of traditional metrics such as AVE, providing a more holistic understanding of media coverage. By enabling businesses to make in-formed decisions and develop effective communication strategies, the Media Output Score can significantly contribute to brand management and public relations practices.

Stronger metrics and the use of insights generated through strategic media coverage monitoring are key challenges in the public relations profession (Zerfass, Verčič, and Volk 2017) because they will enable public relations practitioners to contribute with more meaningful and actionable recommendations to their stakeholders.

However, reflecting on the findings of this research it is important to note that communication professionals must accept and understand that output level metrics are only one part of measuring the effects of media coverage. They should take a reading of these metrics that explores the narrative behind the numbers.

All communication output level metrics should be complemented with metrics evaluating outcomes and outtakes. Only in this way will it be possible to establish an integrated evaluation matrix that allows for effective management of the result of media coverage on corporate reputation.

This study had several limitations. The first limitation is the generalizability of the findings. It was focused on the Portuguese telecommunications industry and on the food retail sectors. The applicability of the new metric may vary across industries and

geographies and further testing is necessary to generalize the findings of this study. Therefore, conclusions for other industries do not start from verified assumptions.

The second limitation is related to the determination of the media weights to the industry. Even if it was determined by a professional with experience in information analysis, it is considered that for better framing of objectives, this assignment should be made by each user of the metric, adapting their communication objectives to the measurement.

The third limitation is related to the automatic sentiment analysis attribution. Sometimes sentiment algorithms lead to incorrect attribution of news sentiment towards brands. To overcome this limitation, the analysis was reviewed and improved by the researchers, changing the automatically assigned sentiment whenever it was not correct. This revision allowed for greater reliability in the results, but in the context of automatic and real-time evaluation of the communication, it would not be possible. Future research should explore more advanced sentiment analysis techniques to enhance accuracy.

The fourth limitation was the readership estimation. Readership was calculated using a weighting based on the website audience and not necessarily on the actual impressions of each news item, which did not allow us to determine exactly what the readership of each news item was, but only its potential. Similar Web recently made available a feature that allows you to know the number of impressions per URL, which may improve this limitation for future research.

As the first research using the Media Output Score, the last limitation is that its support base for the new metric is limited, which leaves open for future research.

Future research should focus on the following areas to further develop and validate the MOS:

- Testing the MOS Across Diverse Contexts: Applying the MOS in different industries, geographical locations, and media platforms will help to validate its effectiveness and versatility, ensuring it can provide consistent and reliable insights across various settings.
- Integration with Outcome and Outtake Metrics: To establish a more comprehensive evaluation framework, future studies should explore integrating the MOS with metrics that measure outcomes (e.g., changes in

brand reputation or consumer behavior) and outtakes (e.g., audience recall or understanding of key messages).

- Development of Automated Tools: Integrating the MOS into media measurement software could allow communication professionals to quickly and reliably assess media coverage, providing a credible test background and valuable feedback from professionals.
- Refinement of Sentiment Analysis and Readership Metrics: Further advancements in sentiment analysis and readership data collection will enhance the precision and reliability of the MOS, making it an even more powerful tool for evaluating digital media performance.

By addressing these areas, future research can contribute to the ongoing refinement and optimization of the MOS, helping to establish it as a standard metric for evaluating digital media coverage and its impact on brand reputation.

4.8 Conclusions of the chapter IV

This chapter has detailed the development, validation, and application of the Media Output Score (MOS) as a novel metric for evaluating digital media coverage. Through a comprehensive linear regression analysis and case studies of major Portuguese telecom brands —Altice/MEO, NOS, and Vodafone— and major food retail brands —Auchan, Continente, Lidl, Mercadona and Pingo Doce —the MOS has proven to be an effective tool for measuring media performance, integrating both quantitative metrics such as frequency, share of voice, and readership, as well as qualitative measures like favorability and engagement.

The discussion of the results indicated that while the MOS provides a nuanced understanding of media coverage, it does not directly correlate with corporate reputation scores. The analysis revealed that factors such as brand history, customer experience, and internal communication strategies play significant roles in shaping public perception, which are not entirely captured by media coverage alone. For example, despite Vodafone's negative media coverage due to a cyberattack, its reputation score remained relatively stable, suggesting that reputation is influenced by a broader set of factors than media visibility and sentiment alone.

These findings highlight the complexity of reputation management and suggest that while the MOS is a valuable tool for assessing media performance, it should be used alongside other measures to gain a comprehensive understanding of brand reputation.

Future research could explore the integration of MOS with additional data sources, such as customer feedback and social media analytics, to develop a more holistic metric that better captures the multifaceted nature of brand reputation. Investigating the applicability of the MOS across different industries and cultural contexts could also enhance its robustness and generalizability. Furthermore, examining the role of internal brand strategies and customer experience in conjunction with media coverage could provide deeper insights into the drivers of corporate reputation.

Overall, the findings of this chapter affirm the value of the MOS as a robust, multidimensional tool for assessing digital media coverage, offering valuable insights for brands to strategically manage their communication and public perception. This metric represents a significant advancement in media analysis, contributing to a more comprehensive understanding of how media interactions influence brand reputation in a rapidly evolving digital landscape.

Conclusion

The research presented in this thesis has explored the development and application of the Media Output Score algorithm as a novel metric for measuring digital media coverage. This study provides a comprehensive analysis of media coverage measurement, focusing on its theoretical underpinnings, methodological approaches, and practical implications. The study was motivated by the identified gap in the existing literature and the need for a standardized, reliable metric for media coverage evaluation. It aimed to address this by investigating the efficacy of the MOS in capturing various dimensions of media coverage, such as visibility, favorability, readership, and social engagement.

The findings of this thesis underscore several important points:

- **Effectiveness of the MOS Algorithm:** The research demonstrates that the MOS algorithm is an effective tool for measuring digital media coverage. This conclusion is drawn from the analysis of data collected over a one-year period from Portuguese telecommunications companies. The algorithm successfully integrates traditional media metrics with social media metrics, providing a robust measure of media coverage that aligns with both academic standards and practical needs of communication professionals.
- **Theoretical Advancements:** The study contributes to the theoretical understanding of media coverage measurement by challenging the reliance on Advertising Value Equivalency (AVE) and similar outdated metrics. Instead, the MOS algorithm aligns with contemporary models, such as the AMEC Integrated Evaluation Framework, by emphasizing the quality and impact of media coverage, not just its volume. This shift highlights the importance of media visibility and favorability in shaping corporate reputation, as discussed by Deephouse (2000) and further explored in more recent studies.
- **Broader Implications for Public Relations:** Additionally, the study found that applying the MOS algorithm could significantly improve public relations strategies by providing a more nuanced understanding of media performance. This insight adds to the existing body of knowledge by demonstrating how quantitative media measurement can be effectively aligned with strategic

communication goals, as emphasized in the literature on PR evaluation models (Buhmann and Likely, 2018; Macnamara, 2017).

This thesis contributes to the field of media and communication in several ways:

- **Theoretical Contributions:** The study advances theoretical understanding by integrating mass communication and resource-based theories to develop a new framework for media coverage measurement. This approach is particularly relevant in the context of public relations and strategic communication, where reliable metrics are crucial for evaluating communication effectiveness.
- **Methodological Contributions:** The research employed a Design Science Research (DSR) methodology, which proved effective in addressing the complexities of media coverage measurement. The development of the Media Output Score (MOS) algorithm as an artifact is particularly noteworthy. This algorithm not only provides a novel approach to quantifying media coverage but also offers a practical tool that can be further developed into dedicated software for measuring media coverage at the output level. This approach offers a replicable model for future studies aiming to develop and test new metrics in media and communication research.
- **Practical Implications:** The findings have practical implications for stakeholders, including policymakers, communication professionals, and organizations seeking to enhance their media strategies.
 - The development and application of the Media Output Score (MOS) algorithm provide a robust tool that can help eliminate the reliance on vanity metrics, such as media impressions or advertising value equivalents (AVE), which have traditionally been used to report media performance to C-level executives.
 - The MOS provides actionable insights that can inform policy development, organizational strategies, and media planning, ensuring a more strategic approach to communication.
 - The MOS algorithm offers a more meaningful and accurate measure of media coverage by focusing on output-level metrics that reflect true engagement and influence, rather than superficial counts. This shift away from vanity metrics is crucial in ensuring that PR and communication

strategies are evaluated on their actual effectiveness and impact, rather than on inflated or misleading figures.

- The MOS offers a significant advantage by providing near real-time feedback on media coverage, which is invaluable for communication professionals who need to react and adjust strategies swiftly. This capability enables a dynamic approach to managing media performance, as professionals can monitor how their messages are being received and interpreted almost instantaneously. In contrast to traditional metrics that may take days or weeks to process and analyze, MOS offers immediate insights, allowing brands to stay agile and responsive in an ever-changing media environment. The real-time nature of MOS means that communication professionals can quickly identify if a campaign or message is underperforming and make adjustments before it becomes too late to mitigate any negative impact. For instance, if a media campaign is failing to generate the desired visibility or engagement, MOS will highlight this early, giving brands the opportunity to shift their approach, reframe their messaging, or target different outlets. This ensures that actions are continuously optimized based on the most current data, enhancing the effectiveness of communication efforts. Moreover, MOS not only provides insights into the brand's own media performance but also serves as a tool for competitive analysis. It offers a clear view of how competitors and other industry players are performing in the media landscape. Professionals can use MOS to track how much media attention competitors are receiving, how their messages are being perceived, and whether they are achieving higher visibility or engagement. This real-time competitive benchmarking allows brands to stay ahead by responding quickly to emerging threats, capitalizing on opportunities, or refining their strategies to reclaim or maintain media dominance. The real-time feedback provided by MOS also helps professionals monitor broader industry trends and external players who are vying for media attention. This is particularly relevant in industries where multiple brands or organizations are competing for the same media space or audience segments. By having immediate access to performance data, communication teams can act on emerging trends,

adjust their messaging to align with audience interests, and ensure they remain relevant in the media dialogue. Overall, the near real-time capability of MOS offers a distinct competitive advantage by giving professionals the power to adapt in real time, optimize their strategies on the fly, and respond effectively to both their own performance and the media activities of competitors and other industry players. This ability to react and adjust on short notice is crucial in today's fast-paced media environment, where the battle for attention is constant and the cost of inaction can be high.

- By adopting the MOS algorithm, organizations can discipline their PR practices to focus on what truly matters: the quality and influence of media coverage. This approach not only enhances the credibility of PR evaluation methods but also supports more informed decision-making by senior executives, ultimately leading to more strategic and effective communication efforts.

While the study offers valuable insights, it is not without limitations. These include the geographic scope, which is limited to Portugal, and the industry scope, focusing only on telecommunications and food retail brands. These constraints may affect the generalizability of the findings to other geographies and sectors. Future research could build on these findings by exploring the application of the Media Output Score (MOS) algorithm in different contexts, industries, and geographic regions.

For instance, in the realm of politics, MOS could be applied to track the media performance of political campaigns by measuring visibility, favorability, and engagement while accounting for social amplification. This would provide valuable insights into the effectiveness of campaign messages and their resonance with specific voter demographics, enabling real-time adjustments in communication strategies. In crisis management, MOS could serve as a critical tool for monitoring media coverage and public sentiment during corporate scandals or public health emergencies. By tracking how crises are reported and amplified across media outlets and social networks, organizations or governments could quickly assess public perception and adapt their communication strategies to mitigate reputational damage. The algorithm could also be useful in event promotion, particularly for large-scale events like international sports competitions or cultural festivals. MOS could evaluate the effectiveness of media

campaigns by measuring audience reach, engagement, and social amplification, helping organizers identify which media outlets and messages generate the most attention. This would allow for fine-tuning of promotional strategies in real time. In the stock market and investor relations context, MOS could assess media coverage of publicly traded companies, particularly in relation to stock performance. By measuring how media reports, social amplification, and public sentiment influence investor behavior, companies could better understand the impact of media on investor confidence and stock prices. This would be particularly useful for guiding communication strategies during earnings announcements, mergers, or other significant corporate events. By extending MOS to these diverse areas, future research could provide a more comprehensive view of media impact across different contexts and sectors, offering a versatile tool for real-time media performance assessment and strategic adaptation.

In conclusion, this thesis has provided a detailed examination of the Media Output Score and its potential to transform the public relations industry. The development of a scientific and robust approach to media measurement not only contributes to academic knowledge but also holds significant practical value in reshaping how PR effectiveness is evaluated and reported.

This research represents a pivotal step towards changing the PR industry by highlighting the critical role of evaluation. Effective evaluation is essential not only for improving strategies and outcomes but also for demonstrating the true value of PR activities to stakeholders. By adopting a more scientific approach to measurement, PR can become more credible and better positioned to compete for larger budgets that are typically dominated by advertising and marketing activities.

In the communications industry, demonstrating the impact of efforts to sustain and reinforce brand reputation is a significant challenge. Professionals often face frustration due to their inability to provide concrete evidence of their effectiveness or to extract valuable insights for improvement. This lack of clear, data-driven evaluation can reduce their relevance and influence within organizations, sometimes leading to demotivation. Introducing a reliable and valid measurement tool, such as MOS, can empower these professionals by allowing them to showcase the true value of their work and make more informed strategic decisions.

PR has a unique ability to influence public perception and behavior more effectively than advertising because it relies on third-party endorsements—others speaking on

behalf of a brand rather than the brand promoting itself. This third-party validation is often perceived as more trustworthy and influential, making PR a potentially more powerful tool within the marketing mix. By enhancing the measurement of PR activities, organizations can better demonstrate this unique value, positioning PR as an integral component of their overall marketing strategy.

Moreover, accurate and meaningful measurement is critical for positioning PR as a more significant and respected part of the marketing mix. When PR activities are evaluated rigorously, it helps establish their value alongside other marketing efforts, justifying increased investment in PR. This, in turn, can lead to more balanced and effective communication strategies that leverage the strengths of both PR and advertising.

Moving forward, the insights gained from this study can serve as a foundation for further exploration and innovation, helping to advance the PR industry towards more effective and impactful practices. By embracing a scientific approach to evaluation, PR professionals can not only improve their own strategies but also elevate the standing of the PR industry as a whole.

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