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***Social media fostering Absorptive Capacity
in Open Innovation***
A survey between Italian manufacturing organisations

SINTESI

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Sommario

L'innovazione al giorno d'oggi è vitale per mantenersi competitivi e adattarsi alle mutevoli esigenze di mercato ed in questo contesto diventano fondamentali i concetti di Open Innovation, che punta ad individuare e sfruttare le opportunità di innovazione provenienti dall'esterno dell'azienda, e di Absorptive Capacity, che indica la capacità di un'azienda nell'identificare, valutare, acquisire e sfruttare le conoscenze esterne ad essa utili per la propria attività. Con questa tesi di ricerca ci si pone l'obiettivo di analizzare il ruolo dei social media nel contesto dell'Open Innovation, fino ad oggi dibattuto marginalmente nella ricerca. Tramite un'analisi della letteratura vengono individuate le tematiche principali su cui si è focalizzata la ricerca negli ultimi dieci anni e a proporre delle ipotesi di ricerca da testare tramite una analisi quantitativa effettuata tramite la metodologia SEM sulle risposte ad una survey che ha visto coinvolte 93 aziende manifatturiere italiane. I risultati mostrano un impatto negativo dei social media nella relazione tra Open Innovation e Absorptive Capacity, ponendo le basi per futuri sviluppi della ricerca sul tema.

Abstract

Innovation nowadays is vital in order to remain competitive and adapt to changing market needs, and in this context, the concepts of Open Innovation, which aims to identify and exploit innovation opportunities from outside the company, and Absorptive Capacity, which refers to a company's ability to identify, evaluate, acquire and exploit knowledge from outside the company that is useful for its business, become crucial. The aim of this research thesis is to analyse the role of social media in the context of Open Innovation, which has so far been only marginally discussed in research. By means of a literature analysis, the main topics where research has focused on in the last ten years are identified. With the support of the information identified, research hypotheses are drawn up to be refuted by means of a quantitative analysis carried out using SEM methodology on the responses to a survey of 93 Italian manufacturing companies. The analysis confirms the hypotheses already dealt with by the research and casts doubt on the actual appropriateness of the use of social media moderation in the relationship between Open Innovation and Absorptive Capacity, laying the foundations for future research developments on the topic.

1. Introduction

The Open Innovation theory (Chesrbough, 2003) argues that organisations can derive significant industrial or economic-financial benefits by opening their internal frontiers and interacting with external actors, such as business partners, suppliers, universities, users, and customers.

Several benefits may arise from the application of the Open Innovation (OI) model:

- Access to external knowledge
- Collaboration and sharing to create an innovative ecosystem
- Reduction in costs and risks
- Faster time-to-market
- Customer-centric innovation

The key aspect to pursuing OI is the ability of the individual organization to identify, assess, acquire, and exploit external knowledge useful to its business; this ability has been named in the literature as Absorptive Capacity (ACAP).

Hence, all the digital tools that offer opportunities to facilitate the access, sharing, and management of external knowledge, while fostering the creation of synergistic connections between the organization and the external actors, gain in importance,.

This dissertation aims to analyze one of the most widely used digital tools within and outside the organisations, i.e. social media. Since the role of social media in the context of OI and ACAP is marginally addressed in the scientific literature, this paper aims to fill this gap by analyzing the impact that the use of social media has on the relationship between OI and ACAP, the opportunities offered for enhancing collaboration, knowledge sharing and external resource management and the conditions that must pre-exist for a proper implementation.

This thesis is supported by a quantitative analysis using a survey carried out among 93 Italian manufacturing organizations.

2. Theoretical Background

The recent scientific production on OI has increased extensively in recent years, often focusing on the relationship between OI, ACAP and performance, making explicit how ACAP enables organizations to effectively identify and assimilate external knowledge: by developing the ability to recognize valuable external ideas and technologies, organizations can enhance their innovation capabilities. In other words, OI complements ACAP by providing access to a wider range of

external knowledge and resources and, while fostering collaboration with external partners, can bring in new perspectives and expertise that can improve performance.

In order to understand the role of social media in supporting the relationship between ACAP and OI, I started with a literature research via Scopus using the query in figure 1 and then filtered the results by selecting only articles, book chapters, conference reviews, and reviews in English published within the last 10 years, so as to focus as much as possible on the state of the art today.

Search within Article title, Abstract, Keywords	Search documents "absorptive capacity" OR ACAP OR "acquisition capacity" OR "assimilation capacity" OR "tranformation capacity" OR "exploitation capacity"
AND	
Search within Article title, Abstract, Keywords	Search documents "social media" OR "online communit*"

Figure 1 – research query

I obtained a database of 56 publications that I analyzed with VOSviewer, a network visualization and analysis software that allows to explore and examine network graphs based on bibliographic data while showing the generated maps using various techniques such as cluster visualization or density map. Given the small number of articles extracted, I carried an analysis involving two methods of clustering, in order to not risk losing parts of the information.

2.1 Bibliographic Citation Clustering

The main technique consists in clustering the articles by means of the common bibliography between them. The result of this approach is shown in figure 2, where it is immediate to note both the presence of a limited number of articles containing a high number of citations compared to the rest of the articles, and a dense network of interconnections between the various articles. In the graph, the different colors indicate the membership of the different clusters identified by VOSviewer, while Figure 3 depicts the year of publication of the various articles, with colors becoming lighter to indicate a more recent date of publication. As imagined the core of the network is mostly composed of articles published between 2018 and 2022, indicating the increasing interest shown by the scientific literature in OI topics.

The top five articles by number of citations (Cao et al., 2021; Scuotto et al., 2017; Cao et al., 2018; Culnan et al., 2010; Di Gangi et al., 2009;) account for 59% of the total. These articles belong to clusters where the most prominent topics are Social Media for ACAP and Innovation Performance, Online Communities for OI, Social Media and ACAP Antecedents for Business value.



With this method, a more fragmented cluster division can be observed, here given the small number of articles, the keywords with the most occurrence are Absorptive Capacity and Social Media and mildly Open Innovation, a result influenced by the search query and which adds little to what was identified by the previous method.

Figure 4 – keyword clustering

The two different approaches to clustering converge in eight research streams, table 1 in fact shows the logical intersection between the two techniques (bibliographic citation and keyword clustering), indicating for every research field the subject matter.

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Table 1 – research streams

According to the analysis from the two previous clustering techniques and the main aim of this thesis, I have decided not to include clusters 7 and 8 in the following considerations since they deviate from the focus of the research. The remaining research streams will serve as a guide in the research hypotheses definition and in the interpretation of the results of the quantitative analysis. I then go on to illustrate for each stream the evidence found among the articles analysed.

2.3.1 Social Media for ACAP and Innovation Performance

Scuotto et al. (2016) provides evidence that using social media tools can improve ACAP, leading to better innovation performance SMEs while Arora et al. (2021) introduce the concept of social capacitance, i.e. the ability of organisations to effectively leverage social media to acquire, share and utilize knowledge.

2.3.2 Social Media for Team Performance

Cao et al. (2018) show that social media use at work is positively related to ACAP and ACAP positively relates to team creative performance and the same relationship is stated by Ince et al. (2021) shown that ACAP expands cognitive capacity, facilitates the emergence of original and useful ideas and enhances the ability to implement creative ideas.

2.3.3 Online community for Open Innovation

Francesconi and Dossena (2012) examine the different phases of the organisation's innovation process including creativity, knowledge assimilation, and internalization. They find out that innovation is fostered by knowledge sharing and social interaction within the online community.

2.3.4 Social Media and ACAP antecedents for Business Value

Culnan et al. (2010) found that for organizations to derive business value from product development through social media engagement with customers, they must develop absorptive capacity (ACAP) to effectively learn from customer-generated content. Schlagwein and Hu (2017) suggest that different uses of social media within an organization can enhance its absorptive capacity by promoting ACAP antecedents such exploratory learning, transformative learning, and exploitative learning.

2.3.5 Downside of using Social Media

Contradicting part of the literature, Loukis et al. (2017) and Kyriakou et al. (2021) state that although social media can be valuable tools for improving ACAP, the effectiveness of their usage depends on various organisational factors and that a digital strategy implementation without prior design brings more complications than benefits.

2.3.6 Social Media for ACAP in Product Development

Peltola et al. (2014) state that the use of social media can enhance ACAP in a context of product development by facilitating knowledge sharing and collaboration among employees, customers, suppliers, and other partners, helping organizations to acquire and assimilate external knowledge more effectively, leading to improved product outcomes and increased customer satisfaction.

3. Research Hypotheses and framework

Based on the existing literature and the research streams described above, the following research hypotheses are introduced and then tested by means of the quantitative analysis.

Hypothesis 1: OI has a direct and positive relationship with organizations' performance (Inauen and Schenker-Wicki, 2011; Noh, 2015; Saliva De Oliveira et al, 2018)

Hypothesis 2: There is a direct and positive relationship between OI and ACAP (Foss, 2011; Petroni et al., 2012)

Hypothesis 3: There is a direct positive relationship between ACAP and organizations' performance (Ali et al., 2021; Fosfuri and Tribo, 2008)

Hypothesis 4: Social Media have a moderating role in the relationship between ACAP and OI (Arora et al., 2021; Mount et al., 2021)

3.5 Research Framework

Figure 5 shows the research framework devised starting from the above research hypotheses .

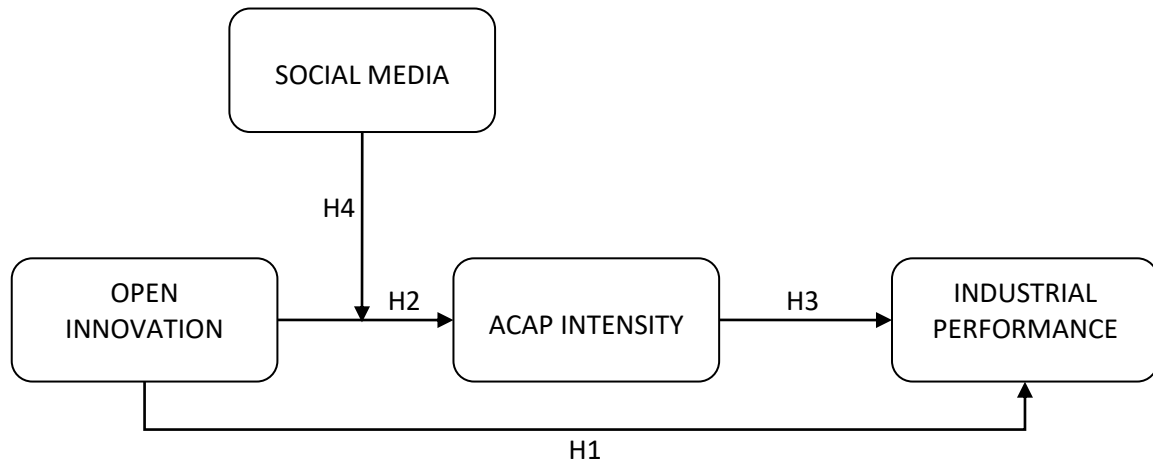


Figure 5 – research network

of the gathered observations, but this will be deepened in the next chapter.

4. Methodology

4.1 Survey

As already mentioned, the analysis is being conducted by submitting a survey to 93 Italian organizations operating in the manufacturing sector.

4.1.1 Target

The questionnaire addresses the CEO, R&D managers, and anyone involved in decisions about OI. Both the expected effort of participation and the perceived significance of the survey in order to deal with managerial reluctance to fill out questionnaires are taken into account. As regards the managers' efforts, several recommendations were followed: the number of elements, the individual informations provided by each answer to a survey question, were limited to 125 and a number of strategies has been used to increase a manager's perception of the study's relevance (such as multiple mailings, direct requirements, promises of the study's findings and the careful selection of survey recipients). Data were collected starting late April 2022 until September 2022.

4.1.2 Sampling method, criteria and size

The target and frame population (i) and sample design (ii) are two key considerations with regard to the sampling method.

As regards (i), in order to encourage study replication, freely accessible materials to create the population frame were used. Given the goal of the study, the focus was on the industrial sector,

which is a well-established area of OI. Finally, businesses with fewer than 10 workers were excluded. Regarding sample design (ii), probabilistic sampling was used to assure sample representativeness and, by extension, the generalizability of the findings.

4.2 Constructs Operationalization

Constructs have been operationalized according to the literature especially as regards OI, Absorptive Capacity, and Performance constructs, while for Social Media constructs, due to the lack of research on its operationalization, I use the organizations' self-reported social media use.

Table 2 reports the variables used to operationalize the constructs.

Construct	Variables	Operationalisation
Open Innvation	Organisation Partner Variety (Bellantuono et al., 2021)	Arithmetic mean of the nine survey elements related to this construct
Absorptive Capacity	Organisation Potential ACAP, Realized ACAP and ACAP organizational antecedents (Enkel et al., 2017; Volberda et al., 2010)	Arithmetic mean of the six survey elements related to this construct
Performance	Organisation Industrial Performance (Lazzarotti et al., 2011)	Arithmetic mean of the eight survey elements related to this construct
Social Media	Social Media use	Organisazions' self-reported social media usage from the survey

Table 2 – construct operationalization

4.3 Quantitative Analysis

To test the research hypotheses, the Structural Equation Modeling (SEM) was used.

SEM is a statistical method that enables the analysis of a number of relationships between one or more independent variables and one or more dependent variables. It is a methodology that incorporates multiple regression analyses between measured variables (basic level of SEM) or measured and latent variables (Ullman and Bentler, 2012).

The software Stata/SE has been used to implement the analysis. The estimation was carried out using the maximum likelihood method, and the model building was done in accordance with the theoretical framework.

5. Results

Table 3 shows the SEM results.

	Coefficient	OIM	z	P > z	[95% confidance interval]	
		Standard error				
Structural						
Absorptive Capacity						
Open Innovation	1.11974	0.2546145	4.40	0.000	0.6207048	1.618775
Social Media	0.1263637	0.1476681	0.86	0.392	-0.1630605	0.415788
Social Media Moderation Effect	-0.889137	0.0519279	-1.71	0.087	-0.1906905	0.0128632
_cons	1.034907	0.638224	1.62	0.105	-0.2159893	2.285803
IndustrialPerformance						
Absorptive Capacity	0.4226697	0.1117055	3.78	0.000	0.203731	0.6416084
OpenInnovation	0.2582773	0.1229196	2.10	0.036	0.0173593	0.4991952
_cons	1.492088	0.3661212	4.08	0.000	0.7745033	2.209672

Table 3 – SEM results

Based on these results, hypotheses H1, H2 and H3 are confirmed with a p-value < 0.001 and a $z > 0$, according to the existing literature. Moreover, the confirmation of the first three hypotheses allows to state that the relationship between OI and performance is mediated by the effect of ACAP.

The fourth hypothesis instead is not confirmed, although the social media moderating effect shows a p-value ~ 0.05 , meaning a slightly significance, z is below 0, preventing us to state that social media strengthen the positive relationship between OI and ACAP. This outcome seems to be in contradiction with that part of the literature that strongly suggests social media as tools capable to enhance organizations' ability to identify and access knowledge beyond their borders (Cao and Ali, 2018; Wieneke and Lehrer, 2016) but also to those who suggest a slight impact on ACAP by external social media (Schlagwein and Hu, 2017). A first explanation could be done by referring to the fifth research stream, where several articles indicated that that the benefits social media bring in terms of ACAP are independent of factors internal to the company such as organizational culture, IT infrastructure, company size, and its human capital (Loukis et al., 2017; Kyriakou et al., 2021). One additional explanation refers to the concepts of prior related knowledge and structure of external and internal communication (Cohen and Levinthal, 1990). When the knowledge coming

from outside strongly diverges from the organization's knowledge, social media may impact negatively the ACAP, because an increasing number of diverging ideas gathered from partners can put a strain on the cognitive limits of the organization, weaken the ACAP acquisition dimension and, in cascade, the following ACAP dimensions. This is supported by the literature (Schalgwein and Hu, 2017) that puts in evidence how, in this context, organizations' focus lever on teams dedicated to getting in touch with customers through social media, and teams that filter the social media knowledge to share it within the organization.

6. Contribution

This thesis focuses on two main aspects: the role of ACAP mediating the relationship between OI and performance and the role of Social Media moderating the same relationship.

The first aspect confirmed with quantitative data how in Italian manufacturing organizations, ACAP has a positive impact on performance and that it plays the role of mediator between the degree of openness of the organization and its performance levels, since it is found that the adoption of OI policies leads to positive effects on both the ACAP and performance.

The second aspect shows how the moderating effect of social media has a negative impact on ACAP, giving two contributions:

- Theoretical Contribution: The gap in the literature on the role of Social Media as moderator is beginning to be filled by adding new elements to the debate, showing in contrast to recent literature the mildly negative moderating effect of social media use on the relationship between OI and ACAP.
- Practical Contribution: Through this thesis practitioners working in OI and R&D can gain insight into the consequences of using social media, understanding how indistinct knowledge acquisition does not absolutely guarantee positive returns, thus shifting the focus to the use of social media to improve performance instead of the OI-ACAP relationship.