Balancing theory and practice: a review of the state of PLS-SEM research by the community of Italian management scholars

FRANCESCA MAGNO[*] FABIO CASSIA[•]

Objectives. *Management researchers have traditionally perceived the need to balance between rigor and relevance, thus simultaneously advancing theory and offering managerial insights. The selection of proper research methods plays a fundamental role. Among them, structural equation modeling (a second-generation technique for multivariate analysis) has witnessed remarkable popularity in the last decades to assess relationships among constructs. There are two main approaches to structural equation modeling: the covariance-based approach (CB-SEM) and the variance-based approach (PLS-SEM). However, until recently, the PLS-SEM has been to a large extent ignored and many scholars have considered structural equation modeling as synonymous with CB-SEM. In the last decade, PLS-SEM has gained a huge interest from social sciences researchers from all over the world and many management journals (such as Journal of Business Research, European Journal of Management, and many others) have published special issues on this method. The renewed interest in PLS-SEM has been largely driven by the extensive work of management and marketing scholars such as Joseph F. Hair, Jr., Tomas M. Hult, Christian M. Ringle and Marko Sarstedt (Hair et al., 2017; Hair et al., 2018). Their well-known book about this method ["A primer on partial least squares structural equation modeling (PLS-SEM)"] has received more than 20,000 citations in Google Scholar since the publication of its first edition in 2014. Given that the use of this method could support the Italian management scholars to further increase their participation to the international debate on management issues, we recently co-edited the Italian version of this book (Hair et al., 2020). The purpose of this extended abstract is to provide a comprehensive review of the state of PLS-SEM research by the community of Italian management scholars.*

Before presenting the research methods and the results, it must be emphasized that CB-SEM and PLS-SEM are appropriate for different research contexts and aims. CB-SEM is a good alternative when the focus of the research is on confirmation (theory confirmation or comparison among theories), while PLS-SEM is particularly useful when the focus is on prediction, such as predicting the key drivers of firm performance or of consumer behaviors. Therefore, the choice between CB-SEM and PLS-SEM must be driven by the specific purpose and approach of the research. As regards the technical aspects, a key difference between CB-SEM and PLS-SEM regards distributional assumptions: CB-SEM requires normally distributed data, while PLS-SEM makes no distributional assumptions. PLS-SEM can also work with small samples and can easily handle both formative and reflective constructs and complex models (with many constructs and relationships).

Based on these premises, in this extended abstract we present a review of the journal articles using PLS-SEM published by Italian management scholars. In particular, we are interested in assessing for what reasons and research purposes PLS-SEM had been selected and preferred over alternative methods.

Methodology. *We conducted a systematic search in the database Scopus using the search terms "partial least squares", "PLS", and "PLS-SEM" within article title, abstract or keywords (only articles were considered while other types of documents, such as book chapters were excluded from the search). In addition, as this review focuses on the community of Italian management scholars, we set the following additional search criteria: "Business, Management and Accounting" as subject area and "Italy" as country/territory. This search provided 112 entries, which are all the journal articles matching the selected keywords, published by at least one co-author affiliated to Italian universities within the disciplines of Business, Management and Accounting. We then manually inspected each of the 112 documents and excluded those published by scholars of other fields, retaining only those published by scholars of the Italian scientific disciplinary sector 13/B2 – management. We also excluded one article because it applied PLS-regression and not PLS-SEM: while the two methods are similar, they are not equivalent (Hair et al., 2017). Finally, we searched for additional articles in the archive of Sinergie Italian Journal of Management (using the same keywords indicated above) and we found one article (Magnani and Zucchella, 2020). Overall, at the end of this process 37 papers were retained and analyzed.*

Findings. *The small number of retrieved papers indicates that PLS-SEM is not yet a well-established research method among the community of Italian management scholars. However, a remarkable growth has been registered in*

---

[*]   Researcher of Management - University of Bergamo
     e-mail: francesca.magno@unibg.it
[•]   Associate Professor of Management - University of Verona
     e-mail: fabio.cassia@univr.it

2020, which may suggest the beginning of a new trend (fig. 1). Table 1 also shows the detailed list of journals in which the 37 studies were published.

Fig. 1: Number of PLS-SEM papers published by Italian management scholars
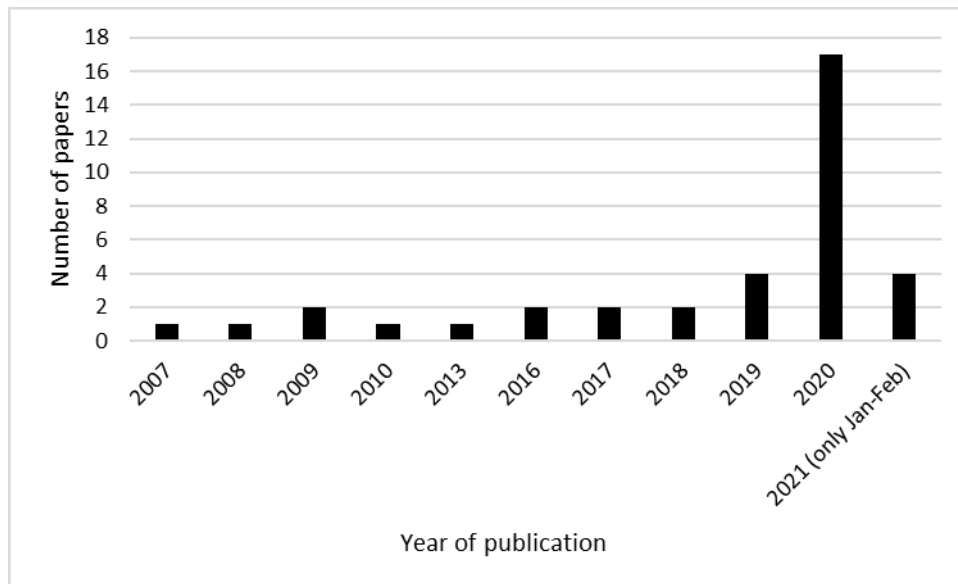
Source: our elaboration

Tab. 1: Journals in which the PLS-SEM studies were published

Journal	Number of papers
British Food Journal	4
Journal of Business Research	4
Industrial Marketing Management	2
Journal of Cleaner Production	2
Journal of Knowledge Management	2
Management Decision	2
Technological Forecasting and Social Change	2
TQM Journal	2
Corporate Social Responsibility and Environmental Management	1
European Journal of Marketing	1
Global Business and Economics Review	1
International Journal of Contemporary Hospitality Management	1
International Journal of Innovation Science	1
International Journal of Operations and Production Management	1
International Journal of Retail and Distribution Management	1
Journal of Consumer Marketing	1
Journal of Entrepreneurship	1
Journal of Intellectual Capital	1
Journal of Retailing and Consumer Services	1
Journal of Service Management	1
Journal of Services Marketing	1
Journal of Technology Transfer	1
Journal of the Academy of Marketing Science	1
Sinergie Italian Journal of Management	1
Sustainability Accounting, Management and Policy Journal	1

Source: our elaboration

We then examined whether and how the papers motivated the choice of PLS-SEM instead of other methods (Table 2). While all the studies provided at least a short description of the PLS-SEM method, 15 of them did not report explicit reasons to motivate the choice of PLS-SEM over other methods (such as, for example. CB-SEM). The remaining studies included multiple motivations. Among them "focus on prediction" and "exploratory research" were the most popular

ones, which indicates a good awareness of the strengths of PLS-SEM. The small sample size was also cited quite frequently. However, it should be remarked that the small sample size per se could not be a sufficient motivation to select PLS-SEM. On this point, it should be additionally noted that some other misunderstandings were found in the application of PLS-SEM, for example the use of some model fit indexes which are appropriate for CB-SEM but not for PLS-SEM.

Tab. 2: Reasons for using PLS-SEM

| Reasons for using PLS-SEM	Number of studies
Focus on prediction	9
Exploratory research	8
Small sample size	7
Use of formative constructs	6
Model complexity	5
Distributional issues	4
Provides no reasons for using PLS-SEM	15

Source: our elaboration

Table 3 summarizes the purposes of the 37 studies, while fig. 2 presents a word cloud of the keywords indicated by the authors of the paper.

Tab. 3: Research purposes/questions

Year	Authors	Research purpose / question
2021	Zollo L., Carranza R., Faraoni M., Díaz E., Martín-Consuegra D.	Drivers of consumers' intention to purchase organic personal care products.
2021	Khan O., Daddi T., Iraldo F.	Effects of dynamic capabilities on circular economy implementation in manufacturing firms.
2021	Ciampi F., Demi S., Magrini A., Marzi G., Papa A.	Relationship between Big Data Analytics Capabilities and Business Model Innovation.
2021	Bhatti S.H., Santoro G., Sarwar A., Pellicelli A.C.	Impact of internal and external factors of social media use by IT organisations on open innovation adoption
2020	Magnani G., Zucchella A.	Relationships between the implementation of a global niche strategy and international performance among SMEs.
2020	Fozouni Ardekani Z., Akbari M., Pino G., Zúñiga M.Á., Azadi H.	Factors explaining consumer intentions to adopt genetically modified foods
2020	Khan O., Daddi T., Iraldo F.	Effects of dynamic capabilities on circular economy implementation and firm performance.
2020	Caputo F., Mazzoleni A., Pellicelli A.C., Muller J.	Factors explaining Big Data Companies' Return on Investment (ROI)
2020	Troise C., O'Driscoll A., Tani M., Prisco A.	Drivers of users' intention to use food delivery apps.
2020	Zollo L., Filieri R., Rialti R., Yoon S.	Direct/indirect relationships between social media marketing activities and consumer-based brand equity
2020	Khatami F., Ferraris A., De Bernardi P., Cantino V.	Direct/indirect relationship between food heritage and clan culture among SMEs in the food industry.
2020	Ferraris A., Vrontis D., Belyaeva Z., De Bernardi P., Ozek H.	Direct/indirect effects of creative partnerships on innovation performance in food companies.
2020	Sciarelli M., Gheith M.H., Tani M.	Effects of both soft and hard quality management on innovation and organizational performance in higher education.
2020	Cassia F.	Effects of reshoring decisions on customer-perceived product quality.
2020	Papa A., Mital M., Pisano P., Del Giudice M.	Drivers of attitude and intention to use smart wearable healthcare devices
2020	Bratianu C., Vătămănescu E.-M., Anagnoste S., Dominici G.	Influences of different types of knowledge on the effectiveness of the decision-making process in business consulting firms.
2020	Calza F., Pagliuca M., Risitano M., Sorrentino A.	Direct/indirect effects of cruise on-board environment on behavioral intentions.
2020	Castaldi L., Sepe E., Turi C., Iscaro V.	Effects of experiential learning programs for entrepreneurship education on educational effectiveness.
2020	Martínez-Martínez A., Cegarra-Navarro J.-G., Garcia-Perez A., Vicentini F.	Drivers of environmental organisational learning in the hotel industry.
2020	Oduro S.	Barriers to SMEs' open innovation adoption
2020	Troise C., Tani M.	Entrepreneur characteristics, motivations and behaviours as drivers of equity crowdfunding campaigns performance.
2019	Ferraris A., Devalle A., Ciampi F., Couturier J.	Effects of global R&D partnerships on innovation performance through search and integrative capacities among SMEs.
2019	Savelli E., Francioni B., Curina I.	Effects of healthy lifestyle on food waste through food waste preventing behavior.
2019	Oduro S., Haylemariam L.G.	Impacts of market orientation on firm performance and the moderating role of CSR.
2019	Cannavale C., Nadali I.Z.	The impacts of different dimensions of entrepreneurial orientation on firm performance.
2018	Merz M.A., Zarantonello L., Grappi S.	Development of a Customer Co-Creation Value (CCCV) scale.
2018	Albort-Morant G., Leal-Rodríguez A.L., De Marchi V.	Internal and external knowledge-based drivers of the firms' green innovation performance.
2017	Scuotto V., Del Giudice M., Carayannis E.G.	Effect of social networking sites and absorptive capacity on SMES' innovation performance.
2017	Savelli E., Cioppi M., Tombari F.	Effects of web atmospherics on shopping centres' customer loyalty through shopping motivation.
2016	Mondéjar-Jiménez J.-A., Ferrari G., Secondi L., Principato L.	Drivers of intention and positive behavior towards food waste.
2016	Gallarza M.G., Arteaga-Moreno F., Del Chiappa G., Gil-Saura I.	Relationships between four intrinsic value dimensions and value-satisfaction-loyalty.
2013	van der Heijden G.A.H., Schepers J.J.L., Nijssen E.J., Ordanini A.	Relationship between frontline service employees' roles and service recovery quality.
2010	Guenzi P., Georges L.	Antecedents and consequences of customer trust in the salesperson.
2009	Guenzi P., Johnson M.D., Castaldo S.	Effects of the components of customer trust on store patronage.
2009	Guenzi P., Georges L., Pardo C.	Impacts of strategic account managers' behaviors on relational outcomes.
2008	Ordanini A., Rubera G.	The effects of procurement capabilities on performance and the moderating role of internet resources.
2007	Guenzi P., Pardo C., Georges L.	Links between relational selling strategy and key account managers' relational behaviors.

Source: our elaboration

Fig. 2: Word cloud of the keywords indicated by the authors
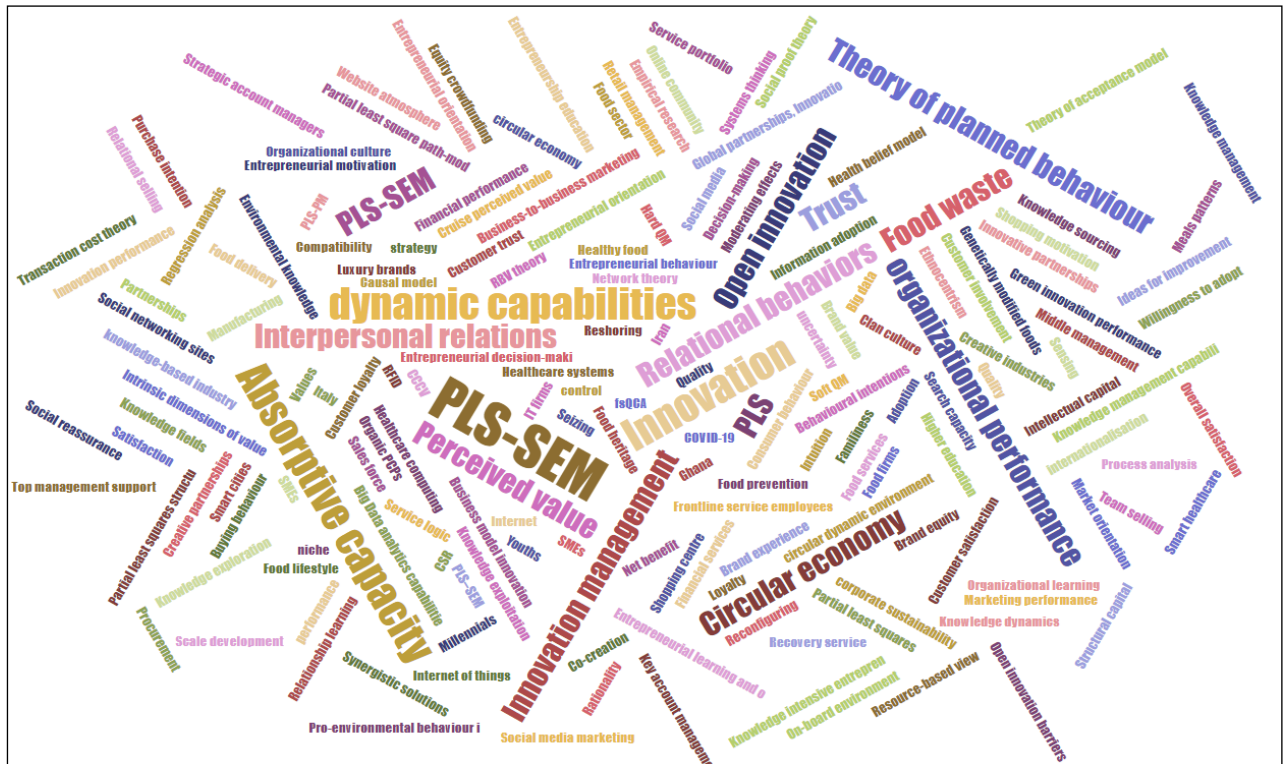
Source: our elaboration

Overall, the analysis of the research questions shows that PLS-SEM has been mostly applied to identify the drivers of firm's choices, strategies and performance, while in a few studies it was used to understand customer decisions to adopt products and technologies. As the analysis of the keywords highlights, the topics and the research contexts are highly fragmented but capabilities and innovation emerge as themes that are more frequently explored through PLS-SEM.

Research limits. *While using a systematic approach to the literature review, the choice to rely only on one database (Scopus) and on the archive of Sinergie Italian Journal of Management may have caused the exclusion of a few journal articles. Moreover, the inclusion of conference papers may enrich the analysis.*

Practical implications. *One of the main strengths of PLS-SEM is its ability to balance rigor and relevance, by focusing on prediction. This analysis reveals that the community of Italian management scholars has not yet adopted PLS-SEM on a large scale. This extended abstract encourages scholars to apply PLS-SEM to research questions that can have both theoretical and practical relevance, such as studies that predict firm performance.*

Originality of the study. *This is the first study to analyze the use of PLS-SEM by the community of Italian management scholars. PLS-SEM is quickly gaining large popularity among worldwide management scholars and may further support the participation of Italian management scholars to the international debate.*

Key words: *PLS-SEM; methods; management; structural equation modeling*

References

ALBORT-MORANT G., LEAL-RODRÍGUEZ A.L., DE MARCHI V. (2018), "Absorptive capacity and relationship learning mechanisms as complementary drivers of green innovation performance", *Journal of Knowledge Management,* vol. 22, n. 2, pp. 432-452.

BHATTI S.H., SANTORO G., SARWAR A., PELLICELLI A.C. (2021), "Internal and external antecedents of open innovation adoption in IT organisations: insights from an emerging market", *Journal of Knowledge Management*, pp.

BRATIANU C., VĂTĂMĂNESCU E.M., ANAGNOSTE S., DOMINICI G. (2020), "Untangling knowledge fields and knowledge dynamics within the decision-making process", *Management Decision,* vol. 59, n. 2, pp. 306-323.

CALZA F., PAGLIUCA M., RISITANO M., SORRENTINO A. (2020), "Testing moderating effects on the relationships among on-board cruise environment, satisfaction, perceived value and behavioral intentions", *International Journal of Contemporary Hospitality Management,* vol. 32, n. 2, pp. 934-952.

CANNAVALE C., NADALI I.Z. (2019), "Entrepreneurial Orientations and Performance: A Problematic Explanatory Approach in the Iranian Knowledge-Based Industry", *Journal of Entrepreneurship,* vol. 28, n. 1, pp. 68-93.

CAPUTO F., MAZZOLENI A., PELLICELLI A.C., MULLER J. (2020), "Over the mask of innovation management in the world of Big Data", *Journal of Business Research,* vol. 119, pp. 330-338.

CASSIA F. (2020), "'Manufacturing is coming home': does reshoring improve perceived product quality?", *The TQM Journal,* vol. 32, n. 6, pp. 1099-1113.

CASTALDI L., SEPE E., TURI C., ISCARO V. (2020), "An experiential learning program for entrepreneurship education", *Global Business and Economics Review,* vol. 22, n. 1-2, pp. 178-197.

CIAMPI F., DEMI S., MAGRINI A., MARZI G., PAPA A. (2021), "Exploring the impact of big data analytics capabilities on business model innovation: The mediating role of entrepreneurial orientation", *Journal of Business Research,* vol. 123, pp. 1-13.

FERRARIS A., DEVALLE A., CIAMPI F., COUTURIER J. (2019), "Are global R&D partnerships enough to increase a company's innovation performance? The role of search and integrative capacities", *Technological Forecasting and Social Change,* vol. 149, pp.

FERRARIS A., VRONTIS D., BELYAEVA Z., DE BERNARDI P., OZEK H. (2020), "Innovation within the food companies: how creative partnerships may conduct to better performances?", *British Food Journal,* vol. 123, n. 1, pp. 143-158.

FOZOUNI ARDEKANI Z., AKBARI M., PINO G., ZÚÑIGA M.Á., AZADI H. (2020), "Consumers' willingness to adopt genetically modified foods", *British Food Journal,* vol. 123, n. 3, pp. 1042-1059.

GALLARZA M.G., ARTEAGA-MORENO F., DEL CHIAPPA G., GIL-SAURA I. (2016), "Intrinsic value dimensions and the value-satisfaction-loyalty chain: a causal model for services", *Journal of Services Marketing,* vol. 30, n. 2, pp. 165-185.

GUENZI P., GEORGES L. (2010), "Interpersonal trust in commercial relationships: Antecedents and consequences of customer trust in the salesperson", *European Journal of Marketing,* vol. 44, n. 1-2, pp. 114-138.

GUENZI P., GEORGES L., PARDO C. (2009a), "The impact of strategic account managers' behaviors on relational outcomes: An empirical study", *Industrial Marketing Management,* vol. 38, n. 3, pp. 300-311.

GUENZI P., JOHNSON M.D., CASTALDO S. (2009b), "A comprehensive model of customer trust in two retail stores", *Journal of Service Management,* vol. 20, n. 3, pp. 290-316.

GUENZI P., PARDO C., GEORGES L. (2007), "Relational selling strategy and key account managers' relational behaviors: An exploratory study", *Industrial Marketing Management,* vol. 36, n. 1, pp. 121-133.

HAIR J.F., HULT G.T.M., RINGLE C.M., SARSTEDT M. (2017), *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM),* Sage, Thousand Oaks, CA.

HAIR J.F., HULT T.M., RINGLE C., SARSTEDT M., MAGNO F., CASSIA F., SCAFARTO F. (2020), *Le equazioni strutturali Partial Least Squares. Introduzione alla PLS-SEM,* FrancoAngeli, Milano.

HAIR J.F., SARSTEDT M., RINGLE C.M., GUDERGAN S.P. (2018), *Advanced Issues in Partial Least Squares Structural Equation Modeling,* SAGE Publications, Thousand Oaks, CA.

KHAN O., DADDI T., IRALDO F. (2020), "The role of dynamic capabilities in circular economy implementation and performance of companies", *Corporate Social Responsibility and Environmental Management,* vol. 27, n. 6, pp. 3018-3033.

KHAN O., DADDI T., IRALDO F. (2021), "Sensing, seizing, and reconfiguring: Key capabilities and organizational routines for circular economy implementation", *Journal of Cleaner Production,* vol. 287, pp.

KHATAMI F., FERRARIS A., DE BERNARDI P., CANTINO V. (2020), "The relationship between food heritage and clan culture: is "familiness" the missing link in SMEs?", *British Food Journal,* vol. 123, n. 1, pp. 337-354.

MAGNANI G., ZUCCHELLA A. (2020), "A model of entrepreneurial internationalisation in uncertain foreign environments: Smaller firms and the global niche strategy", *Sinergie Italian Journal of Management,* vol. 38, n. 3, pp. 23-50.

MARTÍNEZ-MARTÍNEZ A., CEGARRA-NAVARRO J. G., GARCIA-PEREZ A., VICENTINI F. (2020), "Extending structural capital through pro-environmental behaviour intention capital: an outlook on Spanish hotel industry", *Journal of Intellectual Capital*, pp.

MERZ M.A., ZARANTONELLO L., GRAPPI S. (2018), "How valuable are your customers in the brand value co-creation process? The development of a Customer Co-Creation Value (CCCV) scale", *Journal of Business Research,* vol. 82, pp. 79-89.

MONDÉJAR-JIMÉNEZ J. A., FERRARI G., SECONDI L., PRINCIPATO L. (2016), "From the table to waste: An exploratory study on behaviour towards food waste of Spanish and Italian youths", *Journal of Cleaner Production,* vol. 138, pp. 8-18.

ODURO S. (2020), "Exploring the barriers to SMEs' open innovation adoption in Ghana: A mixed research approach", *International Journal of Innovation Science,* pp.

ODURO S., HAYLEMARIAM L.G. (2019), "Market orientation, CSR and financial and marketing performance in manufacturing firms in Ghana and Ethiopia", *Sustainability Accounting, Management and Policy Journal,* vol. 10, n. 3, pp. 398-426.

ORDANINI A., RUBERA G. (2008), "Strategic capabilities and internet resources in procurement: A resource-based view of B-to-B buying process", *International Journal of Operations and Production Management,* vol. 28, n. 1, pp. 27-52.

PAPA A., MITAL M., PISANO P., DEL GIUDICE M. (2020), "E-health and wellbeing monitoring using smart healthcare devices: An empirical investigation", *Technological Forecasting and Social Change,* vol. 153, pp.

SAVELLI E., CIOPPI M., TOMBARI F. (2017), "Web atmospherics as drivers of shopping centres' customer loyalty", *International Journal of Retail and Distribution Management,* vol. 45, n. 11, pp. 1213-1240.

SAVELLI E., FRANCIONI B., CURINA I. (2019), "Healthy lifestyle and food waste behavior", *Journal of Consumer Marketing,* vol. 37, n. 2, pp. 148-159.

SCIARELLI M., GHEITH M.H., TANI M. (2020), "The relationship between soft and hard quality management practices, innovation and organizational performance in higher education", *TQM Journal,* vol. 32, n. 6, pp. 1349-1372.

SCUOTTO V., DEL GIUDICE M., CARAYANNIS E.G. (2017), "The effect of social networking sites and absorptive capacity on SMES' innovation performance", *Journal of Technology Transfer,* vol. 42, n. 2, pp. 409-424.

TROISE C., O'DRISCOLL A., TANI M., PRISCO A. (2020), "Online food delivery services and behavioural intention – a test of an integrated TAM and TPB framework", *British Food Journal,* vol. 123, n. 2, pp. 664-683.

TROISE C., TANI M. (2020), "Exploring entrepreneurial characteristics, motivations and behaviours in equity crowdfunding: some evidence from Italy", *Management Decision*, pp.

VAN DER HEIJDEN G.A.H., SCHEPERS J.J.L., NIJSSEN E.J., ORDANINI A. (2013), "Don't just fix it, make it better! Using frontline service employees to improve recovery performance", *Journal of the Academy of Marketing Science,* vol. 41, n. 5, pp. 515-530.

ZOLLO L., CARRANZA R., FARAONI M., DÍAZ E., MARTÍN-CONSUEGRA D. (2021), "What influences consumers' intention to purchase organic personal care products? The role of social reassurance", *Journal of Retailing and Consumer Services,* vol. 60, pp.

ZOLLO L., FILIERI R., RIALTI R., YOON S. (2020), "Unpacking the relationship between social media marketing and brand equity: The mediating role of consumers' benefits and experience", *Journal of Business Research,* vol. 117, pp. 256-267.