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EXECUTIVE SUMMARY OF THE THESIS

The process of institutionalisation of Technology Social Ventures in Italy: testing the organizational identity of SIAVS through topic modelling

TESI MAGISTRALE IN MANAGEMENT ENGINEERING – INGEGNERIA GESTIONALE

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1. Introduction

In recent years, a series of global societal challenges have highlighted the many pitfalls of the current neoliberal economic model, which pursues profit maximisation without regard to the consequences on public health, social inequalities, and the environment. The COVID-19 crisis has further brought into the spotlight the need for a change in the economic system, as stated by Nobel Prize Laureate Muhammad Yunus: *"Don't plan for economic 'recovery' post Covid. Redesign it from scratch"* [1]. What he is referring to is the new Social Economy paradigm, in which the pure shareholders' interest leaves space to consider a wider range of stakeholders' needs. This shift requires a deep transformation of business organizations' identity in the first place. Hybrid organizations, pursuing simultaneously social and commercial aims, are hence becoming a pillar of the European social fabric, addressing a variety of social services ranging from personal care and work integration to local development and environmental protection [2]. Within this framework, a new entrepreneurial genre, grounded on the values of social entrepreneurship and driven by technological innovation, is emerging: Technology Social Ventures (TSVs). This organizational form leverages entrepreneurial approaches and technological foundations to develop innovative solutions to the most pressing social and environmental needs, adopting a for-profit logic. The importance of TSVs is related to the growing tendency of relying on technology-based innovations to face social and environmental challenges. Traditionally these domains have been handled by the public and the no-profit sectors, which are historically less inclined to engage in technologically innovative products or services. On the contrary, the startup format, strong of an entrepreneurial and innovative identity, has shown how innovations based on new technologies can rapidly scale and be adopted in different contexts. The application of the startup format into the social and environmental domains, currently taking place in the form of TSVs, is key for the development of scalable social innovations and therefore has attracted the attention of both

researchers and policymakers. Although TSVs already dispose of a solid theoretical background [3], from an organizational ecology perspective they are still undergoing the process of legitimization in institutional contexts, which will ultimately wind up when the new organizational form acquires a separate legal status [4]. In Italy, legislators have tried to keep pace with these developments through a coordinated regulatory effort that resulted in the introduction of the SIAVS model, recognising the role of Innovative Startups with a Social Goal in fostering social good. This policy represents the first attempt at institutionalising TSVs within the European context, and it is thus critical to empirically verify its effectiveness. The present research has the objective of studying the SIAVS model and testing whether it is able to grasp the complexity of the TSVs phenomenon, starting from an organizational identity perspective.

2. Literature review

A multi-level framework was adopted to support the literature review.

2.1. Micro-level

From a micro-level perspective, the new entrepreneurial genre of TSVs was studied in the light of organizational theories, investigating its defining features and hybrid organizational identity. TSVs have been defined as organizations aiming at generating a positive impact on society through the development and deployment of new technologies while maintaining an entrepreneurial mindset and financial sustainability [5]–[7]. The main finding shared by the reviewed articles is that TSVs present the identity traits of both Social Enterprises (SEs) and High-Tech Ventures (HTVs) organizational forms [3]. TSVs are thus defined and characterised by a three folded hybridity. Through an in-depth analysis of SEs, HTVs and TSVs key features, it is possible to deduct a framework for the classification of these organizational forms according to how they are oriented along three dimensions of organizational identity: the *societal impact*, the *technological innovation* and the *financing structure*. From an impact perspective, organizations can either pursue a positive societal impact or limit at not having negative impacts. On the other side, the level of technological innovation depends on the exploitation of traditional versus innovative technologies. Lastly, in the financial sphere, we must differentiate between profit-seeking companies and financially sustainable organizations (Table 2.1).

	Societal Impact	**Technological Innovation**	**Financing Structure**
Traditional For-Profit	Non-negative impact ↔	Traditional technologies ↔	Financially profitable ↑
Social Enterprise	Positive impact ↑	Traditional technologies ↔	Financially sustainable ↔
High-Tech Venture	Non-negative impact ↔	Innovative technologies ↑	Financially profitable ↑
Technology Social Venture	Positive impact ↑	Innovative technologies ↑	Financially sustainable ↔

Table 2.1: Framework to classify hybrid organizations based on identity traits.

The major goal of Traditional For-Profits (TFPs) is to be financially profitable, without a specific focus on technology and only guaranteeing a non-negative impact on society and the environment. SEs, on the other hand, aim at creating and fostering social good, maintaining financial sustainability, and relying on traditional technologies. Inversely, HTVs primary aim is to gain a competitive advantage to ensure profitability through the exploitation of innovative technologies, independently of generated impact on society as long as it stays within the legal boundaries. TSVs, lastly, generate positive societal impact specifically through the employment of innovative technologies and maintaining economic independence. TSVs can thus be defined and differentiated from other classes of organizations by means of their specific organizational identity traits.

2.2. Macro-level

Adopting a macro-level perspective, the focus shifted to the Italian institutional context. According to Italian law, Innovative Startups (SIs) are young companies with high technological content and with strong growth potential, and therefore represent one of the key elements of

Italian industrial policy [8]. Additionally, the Italian government recognize a specific kind of SI, called Innovative Startups with a Social Goal (SIAVS). SIAVS are SIs characterised by an explicit social mission, as they pursue, alongside a business logic, goals related to the well-being of the community. Since they are at the same time 'technologically innovative' and 'impact-driven', besides being defined as business entities and thus implicitly 'financially sustainable', SIAVS represent the first attempt to institutionalize TSVs within a broad and structured legal context. The two models were positively received by the Italian entrepreneurial ecosystem. In fact, since their introduction in 2012, the number of both SIs and SIAVS has steadily increased [9]. As of November 2021, 13,639 SIs and 263 SIAVS had registered in the special section of the Business Register.

3. Research questions

Despite SIAVS experiencing constant population growth and generally positive judgments by public opinion, it is essential to empirically verify the appropriateness of the policy. In particular, it has not yet been clarified whether the SIAVS model and the overarching legal architecture is the most suited to capture the new entrepreneurial trends that led to the rise of TSVs. In other words, to test whether the Italian companies currently registered as SIAVS do present all of the organizational identity traits typical of a TSV. The present research aims to empirically test the effectiveness of the SIAVS model at capturing the most recent developments of the social economy, and thus at representing the TSVs phenomenon at the institutional level, answering the following research questions:

RQ 1:
"How can we delineate SIAVS' organizational identity?"

RQ 2:
"Does SIAVS' organizational identity classify them as fully-fledged Technology Social Ventures?"

RQ 3:
"What are the main differences identifiable between SIAVS and TSVs' organizational identity?"

4. Methodology

In order to answer the research questions, the whole Italian Innovative Startups (SIs) ecosystem, populated by almost fourteen thousand companies and more than two hundred SIAVS, was taken into account. After the cleaning phase, and based on data availability, the research sample was reduced to 8,995 SIs of which 203 SIAVS. The data collected consisted of an extensive corpus of textual descriptions provided by the founders of each startup [10]. Employing advanced topic modelling techniques, the most relevant and frequent topics were extracted from the corpus. Specifically, this operation was performed relying on BERT [11]–[13], a *"pre-trained bidirectional"* deep neural network, and resulted in the creation of two hundred semantic topics. Each topic was individually analysed and named by the author and then assigned to one of the following categories: *social*, *environmental*, *high-tech*, *digital*, *economic* and *sectors*. The *social* and *environmental* categories were designed applying the definition of Social Enterprise [2] developed by the European Commission (EC), as shown in Table 4.1.

Field (*category*)	**EC definition**	**Topic name**
Work integration (*social*)	Training and integration of people with disabilities and unemployed people.	Disability; Blind and visually impaired; Diversity; Reading assistant.
Personal social services (*social*)	Health, well-being and medical care, professional training, education, health services, childcare services, services for elderly people, aid for disadvantaged people.	Students; Patients; Sanitisation; Wellness; Elderly; Postbiotics; Pharmacy; Orthopaedics; Cardiology; Training; Diet; Parenting; Virus; Colonoscopy; Disease; Diagnostics.
Local development of disadvantaged areas (*social*)	Rehabilitation schemes in rural or urban areas, development aid and development cooperation in third world countries.	\
Other (*social*)	Including sports, arts, culture or historical preservation, and amateur sports.	Sport; Tourism; Arts; Music.

Table 4.1: Topics assigned to the *social* category.

Although the European Commission includes recycling and environmental protection within the fields of operations of SEs, in this study the green economy domain has been assigned to the separate *environmental* category (Table 4.2).

category	Topic name
environmental	Agriculture; Sustainability; Waste management and recycling; Energy efficiency; Renewable energy; Seismic; Water management and recycling; Battery; Environmental; Biodegradable; Bugs; Sharing Economy; Biogas; Microalgae; Weather; Hydrogen; Plants and flowers; Carbon dioxide; Materials.

Table 4.2: Topics labelled as *environmental*.

Similarly, the *high-tech* category (Table 4.3) was developed with reference to the European Commission's framework of Key Enabling Technologies (KETs) [14]. In particular, this study relies on the classification of KETs as established by the Dutch Research Council (NWO), which defines KETs as *"technologies characterised by a broad application area. They are essential in solving societal challenges and make a major potential contribution to the economy by fostering the emergence of new business and new markets, increasing the level of competitiveness, and strengthening job growth. KETs enable innovations in pioneering processing, manufacturing and services. These technologies are relevant to science, society and the market"* [15].

Field (*category*)	NWO definition	Topic name
Advanced materials (*high-tech*)	Composite and ceramics, Optical/electronic/magnetic materials, Smart materials.	Magnetic.
Chemical technologies (*high-tech*)	Analytic technologies, Catalysis, Electrification, Separation technology.	Supercapacitor.
Digital technologies (*high-tech*)	Artificial intelligence (including machine and deep learning), Big data and data analytics, Blockchain, Encryption technologies/digital security, and Cloud Technologies/Computing.	Blockchain; Artificial intelligence; Cloud; Virtual reality; Cyber security; Big data; Natural language processing.
Engineering and fabrication technologies (*high-tech*)	Additive manufacturing/3D printing, High frequency and mixed-signal technologies, Imaging technologies, Robotics, Sensors and actuators.	Sensor; 3D printing; Robot; Internet of Things; Space; Drones; RFID technology; Sensor.
Life science technologies (*high-tech*)	Biochips and biosensors, Gene editing, Genomics, Industrial biotechnology.	Biotechnology; Genetic; Neuroscience.
Nano-technologies (*high-tech*)	Nanomanufacturing, Nanomaterials.	Nanotechnology.
Photonic technologies (*high-tech*)	Photon generation technologies, Photonic detection.	Radiation; Laser; Ultraviolet.
Quantum technologies (*high-tech*)	Quantum communication, Quantum computing.	\

Table 4.3: List of the *high-tech* topics.

Based on the categorisation of the topics, it was possible to measure the orientation of each startup towards the six dimensions through a set of scores ranging between zero and one. The scores have been calculated as the mean of the categories assigned to the sentences composing the descriptions. Lastly, to reduce the bias introduced by descriptions of variable length, the scores have been adjusted via the Bayesian average [16], according to the formula reported in Equation 4.1.

- *N startups* $i = 1, \ldots, N$
- *M sentences* $j = 1, \ldots, M$
- *C categories* $k = 1, \ldots, C$

Average number of sentences:

- $\bar{M} = \frac{M}{N}$

Category-k average score:

- $\overline{S_k} = \frac{\sum_{i=1}^{N} S_{i,k}}{N}$

Number of sentences of the startup i:

- M_i

Category-k score of the startup i:

- $S_{i,k}$

$$S\_Bayesian_{i,k} = \frac{(\bar{M} \times \overline{S_k}) + (M_i \times S_{i,k})}{\bar{M} + M_i}$$

Equation 4.1: Bayesian average of the scores.

Hence, the present research relies on empirical scores to operationalise the concept of organizational identity. Since the whole sample is composed of for-profit companies, the strategic use of resources to generate economic rents and secure financial sustainability is assumed: the *financial structure* dimension has thus been removed from the analysis. Consequently, it was calculated the positioning of the startups on the remaining two dimensions: the *social* and *environmental* scores are linked to *societal impact*, while the *high-tech* score measures *technological innovation* (Table 4.4).

Dimension	Identity trait	Measured by
Societal impact	Non-negative impact	*social* and *environmental* score below the average
	Positive impact	*social* or *environmental* score above the average
Technological innovation	Traditional technologies	*high-tech* score below the average
	Innovative technologies	*high-tech* score above the average
Financial structure	Financial sustainability	Assumed
	Financial profitability	Assumed

Table 4.4: Measuring organizational identity.

5. Results

To answer the first set of research questions, the mean SIAVS scores were compared to the whole sample averages (Figure 5.1).

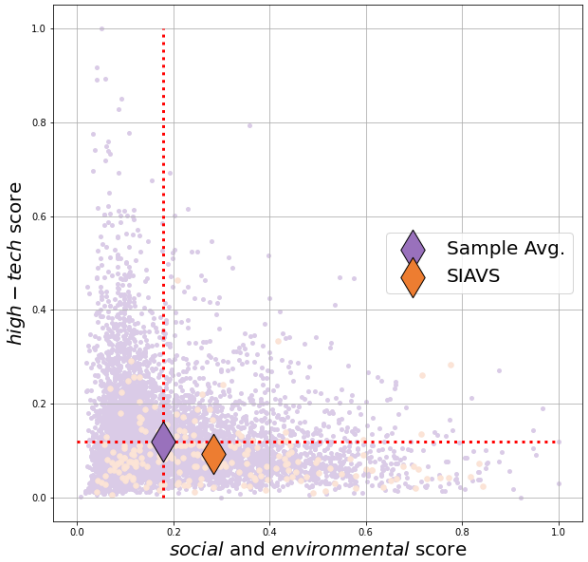

Figure 5.1: Mean SIAVS scores compared to the whole sample averages.

On the horizontal axis of the graph, considering the *societal impact* dimensions, SIAVS are found to be oriented toward positive impact. However, studying the social and environmental facets of impact distinctly, it emerges that they pursue a positive social impact (P-Value < 0.000) while they limit to a non-negative impact orientation from an environmental perspective (P-Value < 0.001). On the vertical axis, conversely, the mean *high-tech* score of SIAVS equals 0.09, while the whole sample average is 0.12: it can thus be claimed that the orientation of SIAVS regarding *technological innovation* leans towards traditional technologies. The statistical validity of the result has been validated through a two-sample T-test. The test confirmed the statistical significance of the difference between the two population means with high degrees of confidence (P-Value < 0.000). To sum up, the organizational identity of SIAVS is characterized by a positive impact orientation in the *societal impact* dimension, while on the *technological innovation* axis they are oriented towards traditional technologies (Table 5.1). As a result, SIAVS cannot be considered as fully-fledged Technology Social Ventures, as the two present significantly different organizational identity traits. In particular, TSVs are characterised by a strong orientation towards innovative technologies while, as revealed by the present research, SIAVS rely primarily on traditional technologies.

Score	SIAVS	Avg.	P-Value	Identity trait
social	0.260	0.144	< 0.000	Positive social impact
environmental	0.089	0.110	< 0.001	Non-negative environmental impact
high-tech	0.092	0.121	< 0.000	Traditional technologies

Table 5.1: Organizational identity of SIAVS.

Further investigating the differences between SIAVS and TSVs, the sample of SIs has been classified according to companies' organizational identity traits, following the scheme proposed in Table 2.1. In the lower-left quadrant of Figure 5.2 are positioned Traditional For-Profit companies (TFPs), characterized by low levels of *technological innovation* and *societal impact*. On the upper-left quadrant, are highlighted the High-Tech Ventures (HTVs), which leverage innovative technologies to gain a competitive advantage. On the opposite side are located the social ventures, divided into Social Enterprises (SEs) and Environmental Enterprises (EEs) based if their positive impact orientation is due to a social or environmental sensibility. Lastly, in the upper-right quadrant can be found Technology Social Ventures (TSVs), divided into Social Tech Startups (STSs) and Green Tech Startups (GTSs). SIAVS are placed in the lower-right quadrant, almost overlapping with SEs.

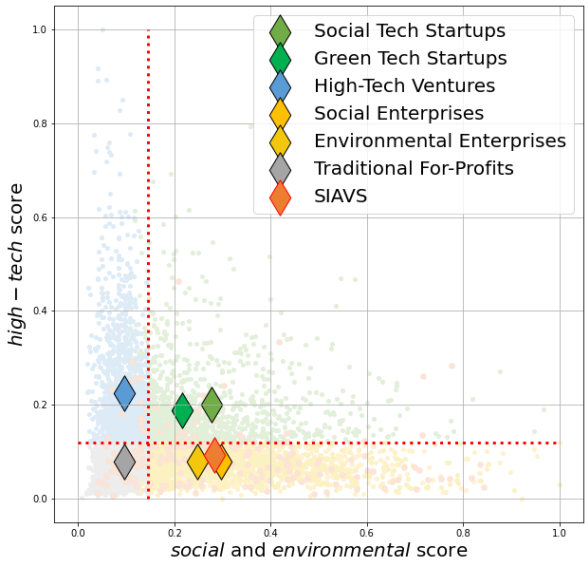

Figure 5.2: Empirical classification of Italian SIs based on organizational identity traits.

The most populated class of organizations is that of TFPs with 3,111 companies, while only 1,275 TSVs were found in the whole sample, indicative of the relative novelty of this category (Table 5.2).

Organizational Form	Size	*high-tech*	*social*	*environmental*
Sample avg.	8995	0.121	0.144	0.110
SIAVS	213	0.092 ↔	0.260 ↑	0.089 ↔
Traditional For-Profits	3111	0.080 ↔	0.092 ↔	0.075 ↔
Social Enterprises	1636	0.079 ↔	0.296 ↑	0.076 ↔
Environmental Enterprises	1441	0.078 ↔	0.088 ↔	0.247 ↑
High-Tech Ventures	1532	0.226 ↑	0.093 ↔	0.071 ↔
Social Tech Startups	759	0.200 ↑	0.277 ↑	0.075 ↔
Green Tech Startups	516	0.188 ↑	0.093 ↔	0.217 ↑

Table 5.2: Mean scores and size of the different organizational forms.

To answer the last research question, a qualitative study on the differences between the features of each organizational form was implemented, analysing the key topics found in the descriptions.

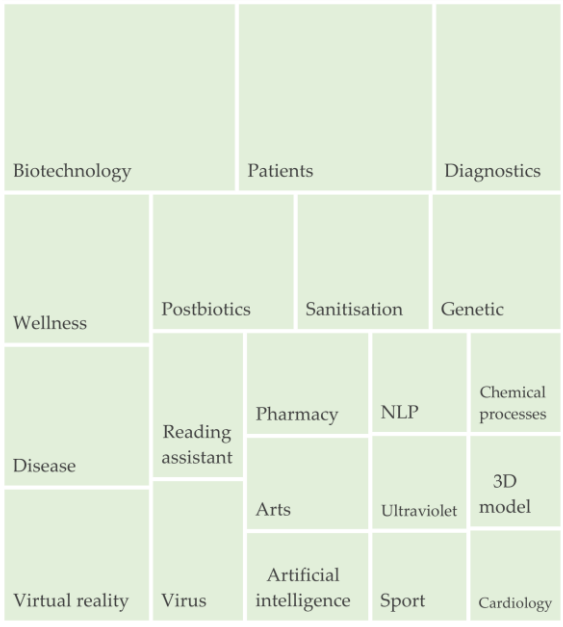

Figure 5.3: Social Tech Startups' key topics.

Figure 5.3 shows the twenty key topics of STSs. Remarkably, most of the topics referring to *societal impact* are related to health, well-being and medical care (*Patients, Diagnostics, Wellness, Disease, Postbiotics, Sanitisation, Virus, Pharmacy, Cardiology*). Furthermore, the seven *high-tech* topics (*Biotechnology, Virtual reality, Genetic, Artificial intelligence, Natural language processing, Ultraviolet, 3D model*) refer to innovative technologies often employed in the healthcare sector, which in western countries is becoming more and more technology intensive. It can thus be inferred that, currently, the sector with the highest number of established STSs in Italy is that of life sciences and healthcare. As a matter of fact, over the last years Italy has seen an increasing call for life sciences innovation and digital health, a trend that the COVID-19 pandemic has further accelerated.

Figure 5.4: Green Tech Startups' key topics.

Analysing Figure 5.4, it emerges that GTSs rely on a very different set of innovative technologies compared to STSs: the seven *high-tech* topics are *Supercapacitor, Magnetic, Blockchain, Biotechnology, 3D printing, Sensors, Nanotechnology*. They mainly refer to innovative technologies able to improve the sustainability of agricultural and industrial processes. Accordingly, the two key *economic* topics are *Chemical processes* and *Engineering*, confirming the focus of Italian GTSs on the development of innovative tools to enhance cross-sectoral sustainability. For example, the blockchain can play a pivotal role in certifying *Sustainability* along the value chain, while 3D printing and sensors can advance industry 4.0 practices towards circularity through improved *Waste management and recycling*. Supercapacitor and magnetic technologies are related to *Energy efficiency*, and biotechnologies and nanotechnologies are critical for the development of new *Biodegradable Materials*.

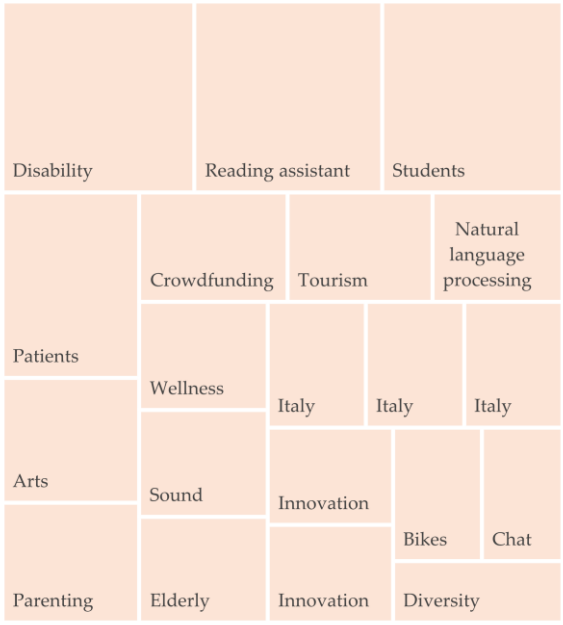

Figure 5.5: SIAVS' key topics.

Figure 5.5 brings out the main differences between TSVs and SIAVS. First of all, SIAVS' only key topics dealing with technology are *Natural language processing* and *Chat*. The latter, not included in the European KETs classification, can be considered a traditional technology. Second, SIAVS serve a wider range of beneficiaries than TSVs, dealing with different social services such as *Disability*, *Parenting*, *Elderly*, *Students* and *Diversity*. Lastly, SIAVS retain a tighter link to the territory, as indicated by the relevance of the topic *Italy*, and the communities they serve, as they can rely on *Crowdfunding* for securing financial stability.

6. Conclusions

This research has employed an innovative methodology, based on advanced deep neural networks, and a massive dataset to empirically analyse the status of institutionalisation of Technology Social Ventures in Italy, finding that the SIAVS model, which represents the first attempt to recognise this new organizational form within an institutional and legal context, is failing at capturing some of the core identity traits of TSVs. In particular, it emerges that SIAVS present a strong orientation towards generating positive social impact. This result is in line with the definition of SIAVS, an Innovative Startup with a Social Goal, and indicates that the requirements for certifying a company's social mission are effective. From an environmental perspective, on the contrary, SIAVS achieved less than the average SIs. In Italy, the SIAVS model is still perceived as exclusively related to social security and welfare services, while organizations working in the environmental and sustainability fields are not yet attracted by the SIAVS legal structure, even though *"environmental and ecosystems protection"* is one of the model's officially recognised fields of operations [8]. On the last dimension considered, *technological innovation*, results indicate that SIAVS are oriented towards traditional technologies, thus missing the focus on innovative technologies typical of TSVs. Indeed, the minimum requirements of innovativeness accepted by the legislator for registering a company as SI or SIAVS are either high R&D expenditures, qualified employees or patents. This set of criteria can be reconducted to the definition of high-tech industries proposed by Baruch in 1997 [17]. However, as the world of high-tech innovations is evolving at an exponential rate, more recent frameworks would be better suited to capture those trends, such as the European Commission classification of Key Enabling Technologies adopted in this research [14]. Therefore, building on the results brought forward by the present piece of work, further research is needed to guide institutions and policymakers and develop a more precise set of criteria, grounded on empirical findings, able to identify TSVs and better capture their complex organizational identity, in particular identifying those technologies that will play a major role in shaping the future of businesses and society.

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