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Blending "hard" and "soft" TQM for academic excellence: the University of Siena experience in the field of Life Sciences

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Abstract

Purpose – Focusing on the adoption of Total Quality Management (TQM) principles in universities, this research paper explores how the "soft" dimensions of TQM trigger its "hard" dimensions considering them at the individual (micro-) and the university (meso-), and eventually at cluster (system-), levels.

Design/methodology/approach – Adopting a qualitative approach, this study presents an in-depth, longitudinal case study of University of Siena, one of the oldest Italian universities, that has been at the core of the research-based cluster on vaccines, today converged in the Tuscan Life Science Cluster. In particular, data were collected between 2018 and February 2022 and consists of archival data (press articles, websites, books), nine interviews to key informants, multiyear experience of the Life Sciences sector by two of the authors and other material put at disposal by university offices, and emails. Data analysis relied on a timeline, a coding procedure that considered three levels of analysis (individual, organization and cluster). Finally, the authors looked at the "how" and "why" the emerged themes have contributed to academic excellence.

Findings – This paper unveils how "soft" and "hard" sides of TQM are blended across multiple levels for reaching academic excellence. The grounded model emerged enlightens the importance of an individual "soft" dimension, academic passion (composed by its three subdimensions of individual research, teaching and entrepreneurial passion) and also sheds light on the organizational "soft" and "hard" sides that the university has been able to design for encouraging research, teaching and third mission quality. Academic excellence has been possible thanks to the capitalization of the individual and organizational "soft" sides into real outcomes as represented by the organizational and individual "hard" sides.

Practical implications – The paper suggests the importance of TQM principles applied at universities' level, providing an in-depth description of "soft" and "hard" sides dimensions of TQM and their impact on all the three pillars of academic excellence. The study findings suggest implications for managers and professionals in the higher education domain as well as for policymakers emphasizing the importance of supporting the individual and organizational soft sides of TQM. The authors provide practical implications recommending universities to consider not only the organizational dimensions but also individual ones when pursuing higher education excellence. In particular, individual passion plays a crucial role and universities need to identify ways of nurturing it. The authors also recommend policymakers to think about new ways to sustain universities as crucial actors in boosting a cluster development, as well as to consider higher education institutions, especially in more rural areas, as a privileged player not only capable of nurturing academic excellence but also able of creating an internationally renowned cluster.

Originality/value – TQM principles have been intensively analysed from an industrial perspective focusing on manufacturing and services, while this paper focuses on TQM in universities, presenting a grounded model that blends the individual and organizational "soft" and "hard" sides.

Keywords Hard side, Soft side, TQM, University, Case study

Paper type Research paper

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1. Introduction

Moving from the key concept of "quality" in terms of effectiveness and efficiency, Total Quality Management (TQM) is a philosophy aiming at pushing excellence (Dean and Bowen, 1994; Gadenne and Sharma, 2009; Unnikrishnan *et al.*, 2019; Wilkinson, 1992). Over the past decades, studies on TQM have focused on talking over "*how to manage quality to gain a competitive advantage through greater customer satisfaction and superior performance*" (Aquilani *et al.*, 2017, p. 185), emphasizing TQM either as *technical* solution or a "*new form of sophisticated work intensification*" (Psychogios *et al.*, 2009). Scholars have often looked at TQM within organizational boundaries distinguishing between its "hard" dimension, such as methods used to boost operational efficiency (e.g. see the TQM methods in Douglas and Judge, 2001), and "soft" one, as in the case of human resource management (Psychogios *et al.*, 2009; Wilkinson, 1992) and principles (Psychogios and Wilkinson, 2007).

TQM principles have been applied in both manufacturing and services contexts, especially from an industrial perspective, while less is known with respect to TQM within higher education (for reviews see Nasim *et al.*, 2020; Jasti *et al.*, 2022), and universities in particular. Albeit its relevance has been recognized by long time (Stuelpnagel, 1988), TQM has been at the core of a comparatively smaller number of publications (Kanji and Tambi, 1999; Koch, 2003; Owlia and Aspinwall, 1997) that have mainly looked to its implementation models (Motwani and Kumar, 1997), the quality assessment of academic programs (Dwaikat, 2020), the reasons why it is difficult for a university adopting TQM practices (e.g. Koch, 2003), the development of TQM coursework (Irfan *et al.*, 2021), the need for an integrative model of quality management systems (Manatos *et al.*, 2018), among the others.

Although researchers have clearly pointed out the role of TQM for organizational excellence and customers' (Ershadi *et al.*, 2019) and people (Calvo-mora *et al.*, 2005) satisfaction, that in turns leads to higher performance (Calvo-mora *et al.*, 2005; Rahman and Bullock, 2005), we think that previous studies present at least two main limitations. First, they tend to analyse TQM impact more from a static than a dynamic perspective, looking at the influence of soft and hard sides of TQM in a specific point of time rather than over time. In other terms, what is missing is an understanding of how soft and hard sides of TQM develop over time, i.e. a longitudinal perspective. Second, albeit they recognize the importance of involving all organizational levels to the quest for quality (e.g. Calvo-mora *et al.*, 2005), scholars have analysed the influence of hard and soft TQM dimensions mainly from a quantitative point of view – for example looking at the impact of soft TQM practices on organizational performance (Cucino *et al.*, 2022), thus missing a deeper understanding of how and why TQM at individual and organizational levels influence each other, and eventually have an impact also beyond the organization. In other terms, extant research has disregarded how TQM, as a philosophy, could be embraced by the university and diffused within (at both micro- and meso-levels) and beyond the university's boundaries (i.e. system-level) over time.

Inspired by previous research on multi-levels studies, such as organizational practices diffusion (Ansari *et al.*, 2010), this paper explores how the "soft" dimensions of TQM trigger its "hard" dimensions considering them at the individual (micro-) and the university (meso-), and eventually at cluster (system-) levels. In doing so, we retrospectively analyse the case of University of Siena (UoS), among the oldest Italian universities (since 1240). The UoS has been at the core of the research-based cluster (Patton and Kenney, 2010) that has developed over vaccines that today has converged in the Tuscan Life Science cluster. Therefore, this case study provides rich evidence on how the soft sides of TQM advance not only organizational performance in higher education but, throughout higher education, also the creation of an internationally renowned life science cluster. Moreover, the paper adds to extant scholarly research that has mainly focused on the hard sides of TQM and the measurement of quality in higher education (see, for example, Dwaikat, 2020), and also extends more recent studies that have investigated the soft sides of TQM but within a specific academic division, such as

university technology transfer offices (e.g. Cucino *et al.*, 2022), thus providing a multi-dimensional ("soft" and "hard" sides of TQM) and multi-level (individual and organizational levels) conceptual framework.

The paper is structured as follows. First, a literature review on the "soft" and "hard" dimensions of TQM is presented, followed by the contextualization of TQM in the universities setting and the conceptual framework. The methodology adopted, with an in-depth description of data collection and data analysis, follows (section 3). The results of our analysis are presented (Section 4) and discussed (Section 5). Finally, a conclusion section (section 6) with limitations and future research directions ends the paper.

2. Literature review and conceptual framework

2.1 The hard and soft sides of total quality management

TQM is conceived as a management philosophy aiming at transforming an organization to an excellence in the quest for quality (Dahlgaard-Park, 2011; Ershadi *et al.*, 2019; Gadenne and Sharma, 2009). Several scholars have noticed multiple core principles of TQM (for a review see Aquilani *et al.*, 2017; Dahlgaard-Park, 2011), which could be summarized in ten core concepts, namely "*strong management commitment/leadership/strategically based; continuous improvement; focus on customers/customer-driven organisation; total involvement/total commitment/total responsibilities; actions based on facts/scientific approach; focus on processes; focus on employees/teamwork/motivation/empowerment; focus on learning & innovation/training and education; building partnership between suppliers, customers, and society; systematic approach/building a TQM culture*" (Dahlgaard-Park, 2011, pp. 496–497).

Research has soon highlighted that TQM presents both "soft" and "hard" sides, thus shedding light on the importance of intangible and tangible aspects that could lead to higher quality and organizational excellence. In particular, Wilkinson (1992, 2004) distinguishes between the "soft" side – that has to do with the management of human resources (HR) and therefore employees' involvement and commitment – and the "hard" side – that has to do with operations and the underlying procedures. In his contributions, he notices the importance of adopting flexible organization structures, setting common goals that lead teamwork and the role of managers as leaders in introducing organizational policies and programs that could leverage all the levels of the organization. In other terms, increasing attention has been deserved to the "human factor" (Wilkinson, 2004) since TQM depends on the involvement of employees at all levels.

Over the years, contributions have stratified with respect to the identification of practices that organizations could introduce in the pursuit of TQM. For example, Psychogios and Wilkinson (2007) identify 9 "soft" TQM concepts, namely total employee involvement, continuous improvement, continuous training, teamwork, empowerment, top-management commitment and support, democratic management style, customer/citizen satisfaction and culture change; and 8 "hard" TQM practices, namely statistical process control, ISO 9000 series, Pareto analysis, matrix diagram, histograms and process charts, tree decision diagram, critical path analysis, Fishbone or Ishikawa diagram. Such contributions clearly point out that TQM is a broader philosophy whose features can be applied to different contexts, albeit most of studies have focused on companies.

Extant research has also investigated the soft and the hard sides of TQM jointly. For example, focusing on manufacturing firms, Saleh *et al.* (2018) found a relationship between hard and soft TQM practices, while Rahman and Bullock (2005) looked at the effect of soft TQM on hard TQM and on organizational performance. Fotopoulos and Psomas (2009) identified the major role of soft TQM as compared to hard for quality management results. These examples show that soft and hard sides need to be jointly considered when looking at organizational excellence, but they do not shed light on how one interacts with the other and the reverse, especially over time.

2.2 Total quality management in universities

Although scholars have clearly highlighted how higher education organizations, similarly to what companies do, could support TQM via training students and enhancing interaction between fields (Kanji and Tambi, 1999; Stuelpnagel, 1988), and may carry out similar activities to those experienced in other sectors (Owlia and Aspinwall, 1997), lesser is known about TQM in universities. Contrary to higher education in general, such as high schools where the main activity is education, universities need to excel in all their three missions: education (teaching and learning), research and third mission (technology transfer and public engagement) (for a review on the third mission of universities see, for example Compagnucci and Spigarelli, 2020). In fact, some recent literature reviews on TQM and education (Nasim *et al.*, 2020; Jasti *et al.*, 2022) have noticed that the aspects related to research and industry engagement have been lesser investigated as compared to education (Nasim *et al.*, 2020) and that "*more exploratory longitudinal studies are required to be done*" (Jasti *et al.*, 2022, p. 1313).

Scholars have put forward how TQM is implemented especially in the administrative and education issues of the universities (Calvo-mora *et al.*, 2005; Owlia and Aspinwall, 1997), while it is more difficult to understand at individual researcher level. The quality of education can be measured for example by assessing the quality of academic program (Dwaikat, 2020), recurring to self-assessment or external assessment and accreditation systems (Calvo-mora *et al.*, 2005). In studying TQM implementation in some UK institutions, Owlia and Aspinwall (1997) proposed a causal diagram for quality in higher education, suggesting that positive feedback loops activate a virtuous cycle in terms of improved quality of graduates, staff, reputation, grants and power, among the others. However, they do not explain how TQM is embraced also at researchers' level. This may be related also to the fact that academia has problems in welcoming TQM practices due to the long-lasting academic doctrine of individual's freedom (Koch, 2003). In the quest for quality, researchers and employees, students as well as their parents, and the government and industry need to be considered as universities' customers (Kanji and Tambi, 1999).

2.3 Conceptual framework

The literature reviewed paves the way for the need of a unifying framework capable of linking the several levels across which TQM, in both its "soft" and "hard" sides, may be embraced within the university and beyond its boundaries. The conceptual framework of this paper is built upon considers two aspects.

First, based on the literature reviewed, this paper considers the distinction between soft and hard sides of TQM. However, whether previous evidence shows to what extent soft and hard sides impact organizational performance (e.g. Rahman and Bullock, 2005) or focuses on the influence of specific TQM soft practices – such as the empowerment and the engagement of employees – on organizational performance (such that of technology transfer offices) (Cucino *et al.*, 2022), we want to shed light on the dynamics between TQM soft and hard sides, looking at how they develop over time. This consideration leads to the need of considering a *longitudinal perspective* capable of unveiling how TQM *soft and hard sides* develop, interacting and influencing one another.

Second, albeit research exists on TQM in higher education (see Nasim *et al.*, 2020 and Jasti *et al.*, 2022 for recent reviews), we scantly known how TQM in universities develop (i) within each of the three pillars characterizing the university context (i.e. education, research and third mission); and (ii) at micro-level (i.e. the researcher), meso-level (i.e. the organization) and eventually beyond organizational boundaries at system-level (i.e. the cluster). Therefore, also informed by multi-levels studies (e.g. Ansari *et al.*, 2010) and by three missions of the university, this paper considers these three levels of analysis along the education, research and third mission pillars of university excellence.

3. Methodology

In order to answer to the research question underlying this study – i.e. how the "soft" dimensions of TQM trigger its "hard" dimensions considering them at the individual (micro-) and the university (meso-), and eventually at cluster (system-), levels – , we conducted an in-depth single case study (Siggelkow, 2007; Yin, 1994). The case study method is appropriate when you want to answer "how"-related questions. In particular, we look for an *illustrative* case study (Siggelkow, 2007) for two main reasons. First, since the "soft" sides of TQM are often conceptual, we want to understand them in real life. Second, we aim to explore how the "soft" and the "hard" sides of TQM are related. We searched for a case of a higher education institution where we could investigate in-depth the "soft" and the "hard" sides of TQM at individual, organizational and eventually cluster level, and we chose that of University of Siena (UoS) for several reasons. First, the UoS is one of the most ancient universities worldwide and it is nowadays internationally renowned in a field of research (that of Life Science and, more specifically, in vaccines) since the beginning of last century. Therefore, it seemed to be appropriate as an illustrative case of excellence. Moreover, due to the nature of "soft" side dimensions, we needed an organization that could provide us with access to data. The fact that all the authors are insiders of the UoS and one of them has more than a decade of experience and direct participation in the cluster's activities allowed us to collect data at multiple levels and over several years. Furthermore, the trust developed along the years with some of the key informants allowed them to be transparent about their own perspective.

Founded about eight centuries ago, UoS is nowadays recognized as a key actor within the Tuscan Life Sciences Cluster (Pucci *et al.*, 2018; Pucci and Zanni, 2012, 2016). To understand how TQM philosophy has led the university, eventually contributing to the cluster's development, we jointly considered three levels of analysis: individuals (micro-level), how they have influenced the university (meso-)'s development and then how the university (meso-) has helped the cluster (system-)'s evolution.

Aguinis and Solarino (2019) provide transparency criteria in qualitative research for allowing replication. In order to facilitate empirical replication, i.e. "*a previous study is replicated using the same procedures but a different population*" (p. 1292), we provide an in depth description of the procedures adopted as described in the data collection and the data analysis.

3.1 Data collection

Data were collected between 2018 and February 2022. Data collection started with an analysis of the archival data. Press articles, websites, books about the cluster evolution were collected, a timeline of events and key persons involved were identified. Additionally, two out of four of the authors have a multiyear experience of the Life Sciences sector and one of them has been directly involved over about the last decade in the development of the cluster. Therefore, we triangulated the secondary data collected and the direct experience and individual knowledge of the two authors. The same two authors also identify four key informants who were interviewed in 2018:

(1) Prof. Paolo Neri, the 85 years old Prof. Achille Sclavo's grandson;

(2) Prof. Annalisa Santucci and Prof. Luisa Bracci, the two professors leading two research groups whom scientific outputs are considered of high quality by their respective communities linked to the Life Sciences sector, and Prof. Neri's formerly students;

(3) Dr. Andrea Paolini, the General Manager of Tuscan Life Sciences.

The interview protocol adopted relied on three main sections, each of them comprising open ended questions. In conducting the interviews, we did not follow a structured approach, but we left each informant telling us his/her history and role within UoS and the cluster development.

Moreover, additional data were collected still in 2018 via other five interviews to those university offices that mostly collaborate with the industrial context, namely the so-called Liaison Office (i.e. the Technology Transfer Office of UoS) and the Research and Grant Office (today re-named in Grants and Research Management Division), one former professor at UoS who worked at University from 1976 to 2012, and who is now involved in her spin-off, one professor and one researcher involved in the museum system of UoS.

To sum up, data were collected through nine in-depth interviews, lasted between 24 and 90 min, that were recorded and transcribed. Additional material was collected thanks to the university offices and newspaper articles, also made accessible by some of the interviewees. Five books were also used. All these data also served for data triangulation (Yin, 1994).

Finally, during the 2020–2022, we also collected UoS' e-mails concerning the main changes within the UoS related to Life Sciences and we participated to online events. For example, in 2021, Dr. Rino Rappuoli (Chief Scientists at GSK and extraordinal professor in molecular biology at the Department of Biotechnology, Chemistry and Pharmaceutics of University of Siena) was granted the *laurea honoris causa* (non-enabling) in Medicine and Surgery.

The data collection ended when the authors noted that there was not new – or only marginal – insight from additional material.

3.2 Data analysis

Data analysis relied on a coding procedure (Miles *et al.*, 2014) that considered the three levels of analysis, the individual (academician/researcher), the organization (university) and the cluster, for which we looked at the main events characterizing the evolution of the UoS research-centric cluster (Figure 1). All the authors also identified the main key events and the relevant key actors that characterized the development of cluster, focusing on those where the UoS has played a crucial role. Four main events were identified:

(1) the foundation of "Istituto Sieroterapico Vaccinogeno Toscano" (ISVT) in 1904 by prof. Achille Sclavo;

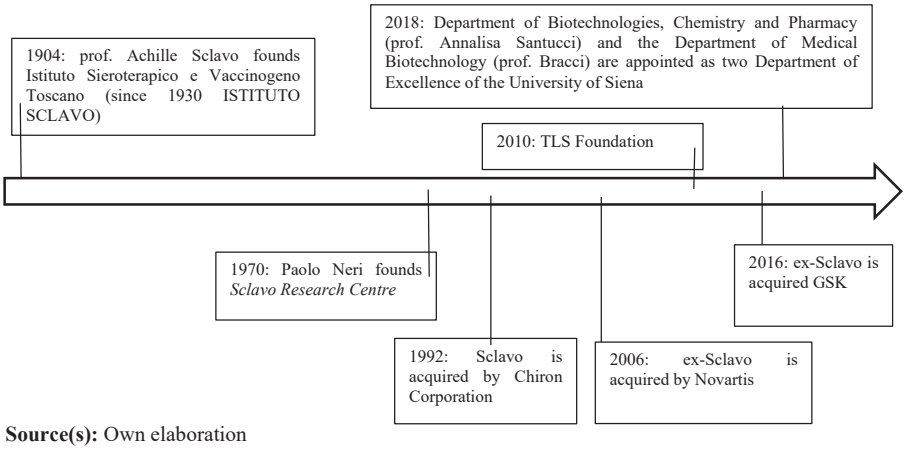


Figure 1.
The main events of the University of Siena cluster emergence and development

Source(s): Own elaboration

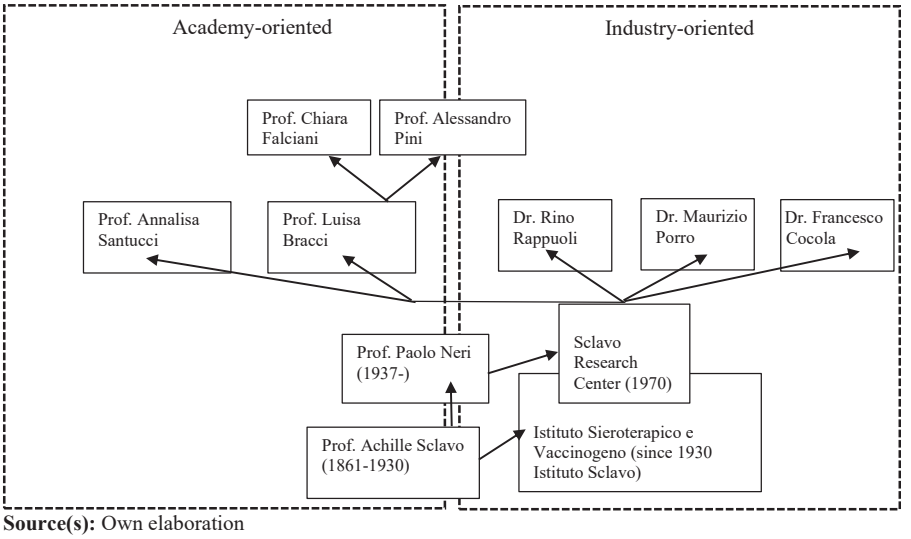
(2) the foundation of Sclavo Research Center (SRC) in 1970 and its following acquisitions (1992 by Chiron Corporation, 2006 by Novartis Vaccines and Diagnostics, 2016 by GlaxoSmithKline Vaccines). For SRC, prof. Paolo Neri and some of his alumni, in particular Dr. Rino Rappuoli who has been the head of the Research in Chiron (1992), Novartis Vaccines and Diagnostics (2006) and GSK Vaccines (2016) and President of the Tuscan Life Sciences district, were key;

(3) the creation of Tuscan Life Sciences (TLS) Foundation (2010) with the involvement not only of UoS, but also of regional authorities and other institutions, such as Monte dei Paschi di Siena (the bank founded in Siena in 1472);

(4) the scientific recognition of renewed groups of scientists within the analysing sector (two departments were recognized as Department of Excellence by the Italian Ministry in 2017); two scholars who were linked with prof. Paolo Neri, namely prof. Annalisa Santucci and prof. Luisa Bracci, were also involved.

The analysis allowed the authors to create a sort of "genealogy tree" (Figure 2) that links key actors in the evolution of UoS research-centric cluster. Figure 2 distinguishes between academy-oriented and industry-oriented persons. On the left side of Figure 2, we find persons who were, have been and are mainly linked to the university, as researchers and professors. On the right side, we find key actors that, being linked to the ancestor (prof. Achille Sclavo, Rector of the University of Siena three times: 1914–1917, 1924–1926, and 1927–1929), represent the link with the industry.

Then, the analysis proceeded as follows. Bearing in mind the three levels of analysis (individual, organization/university and cluster), we started with an open coding of each interview and the other data collected. This open coding was conducted by the first author, who also performed axial coding. The results from the axial coding were eventually shared and discussed with all the other authors. At this stage, informed by previous research according to which universities pursue three missions, i.e. research, teaching and third mission, and also considering what emerged by the literature, and in particular the distinction between "hard" and "soft" dimensions of TQM, the authors arranged several times the data,



Source(s): Own elaboration

Figure 2.
The genealogy tree of academic passion from Prof. Achille Sclavo

refining the second order themes and identifying five aggregate dimensions. Data structure is presented in Figure 3 and some representative quotations/data are presented in the manuscript.

Finally, the authors looked at the "how" and "why" the emerged themes have contributed to academic excellence, and eventually this academic excellence has nurtured the development of the cluster. Therefore, a grounded model where the "soft" and "hard" sides of TQM at individual and university (organizational) level are linked was developed (Figure 5).

4. Results

4.1 The individual "soft" side

During our interviews, it clearly emerged that individual passion for the three pillars of academic life (research, teaching and third mission) represents one key element charactering the behaviour of other individuals who have been important in the development of academic excellence and, eventually, the development of the research-centric cluster.

Albeit the history of the Siena's life sciences (LS) cluster started in the XVIII century (with Paolo Mascagni, an Italian physician and professor known for core findings on the lymphatic systems), it is with the arrival of prof. Achille Sclavo that were laid the foundations of the current university-research centric cluster.

On September 1st 1898, Achille Sclavo became full professor of Public Health at the UoS, bringing here all his experiences collected across Italy (see Vannozzi, 2004) and continuing fighting against all those illness (e.g. tuberculosis, malaria): his dream was of contributing to the sanitary battles through science and education. Assisted by his university team, he aimed at "hygienic redemption" (Orsini, 2016; Vannozzi, 2004), thus focusing on vaccines and sera. This choice changed everything. Indeed, after a long period of research on anti-anthrax serum (1895–1903), this research group obtained a financial grant by the Accademia di Medicina di Torino. Motivated by the willingness to diffuse their results for the benefit of the whole population, Prof. Sclavo and Prof. Ivo Bandi invested the whole grant to create a production facility, named "Istituto Sieroterapico Vaccinogeno Toscano" (ISVT), "for the preparation of sera, vaccines, viruses, related products and other therapeutic and prophylactic materials" (Atto Costitutivo, deposited in the Historical Archive of Siena Municipality). This unforeseen firm founded by academicians was going to trigger a university research-centric life sciences cluster. Furthermore, Prof. Sclavo aimed at diffusing his scientific advancement not only among research peers but to the entire Italian population. In so doing, it is worthy to mention his constant educational effort at all the levels, from primary schools to university levels. His care for education and society also pushed him outside his research boundaries: he became the President of the sporting club Mens Sana, introduced the Boy Scouts group, and provided ISVT's stalls at the service of the horses used for the Palio, the multi-centenary horse race of Siena.

In 1935 Dario Neri was appointed as the new CEO of ISTITUTO SCLAVO (as ISVT was renamed after its founder's death). Dario Neri, Achille Sclavo's son-in-law, was not an academician, but a painter (Pezzo, 2013). Nonetheless, he was the first to understand the importance of marketing and internationalization, thus introducing a new organization of the firm, reorganizing the distribution channels and investing in communication. Moreover, his passion for xylography and painting pushed him to relaunched ISTITUTO SCLAVO image (Orsini, 2016). Dario Neri, unwittingly, brought the evidence that crossing boundaries of a single subject can be a powerful tool to innovate and grow.

A key figure for this second phase is Paolo Neri (1937–), Achille Sclavo's grandson, who started his academic career at UoS in 1971. After his graduation in chemistry, with an innate passion for biochemistry but not for vaccines, Paolo Neri spent few years in Rome at Centro

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Figure 3.
Data structure

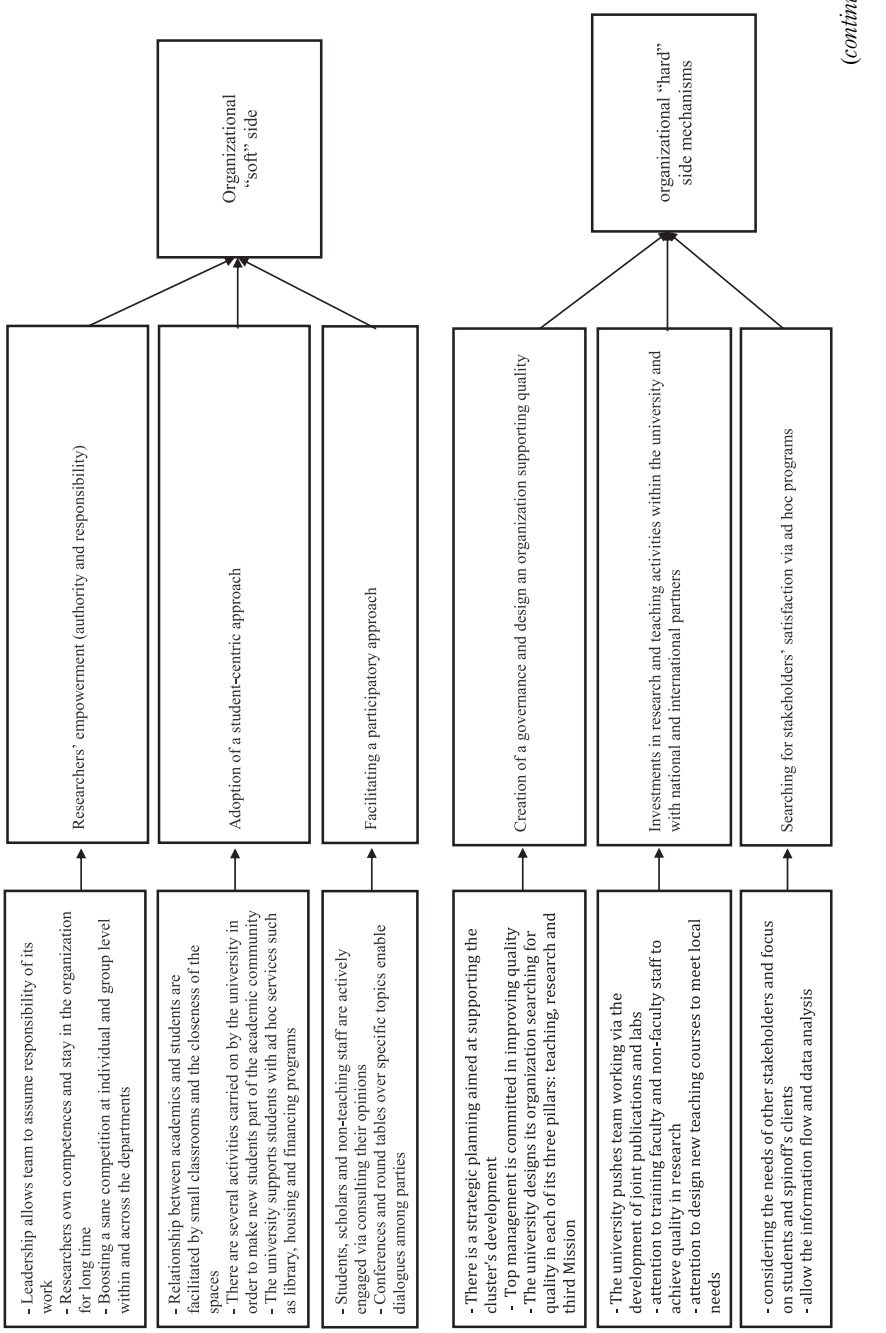

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Figure 3.

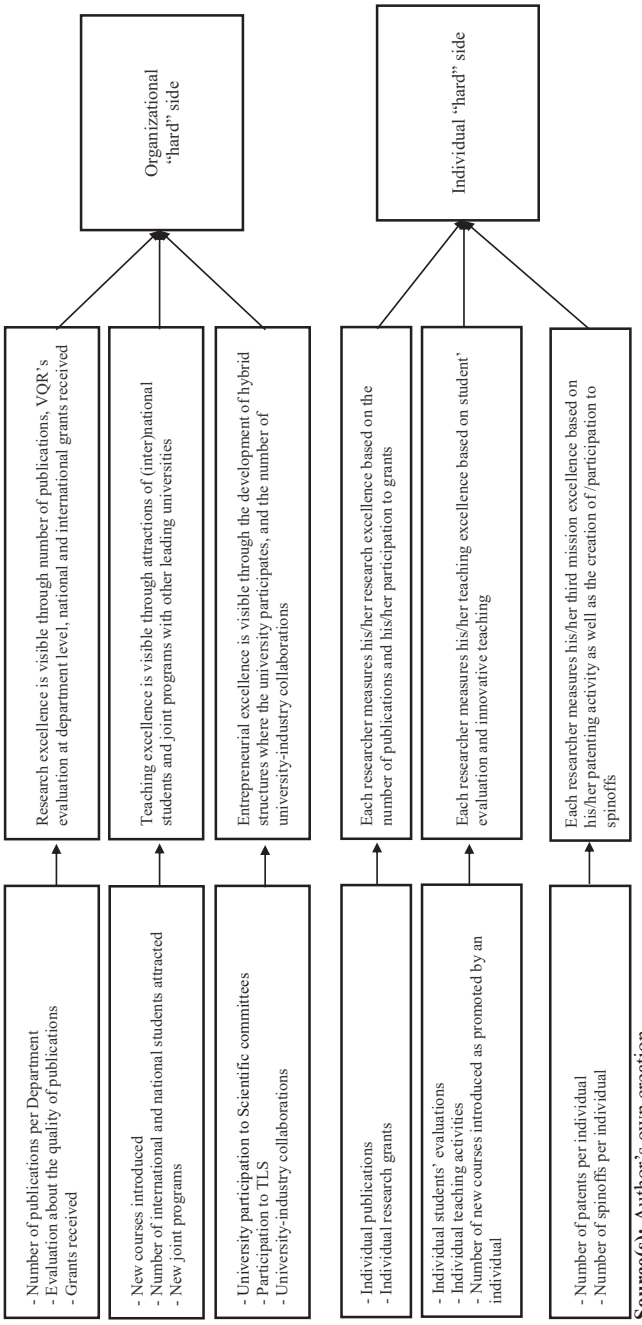

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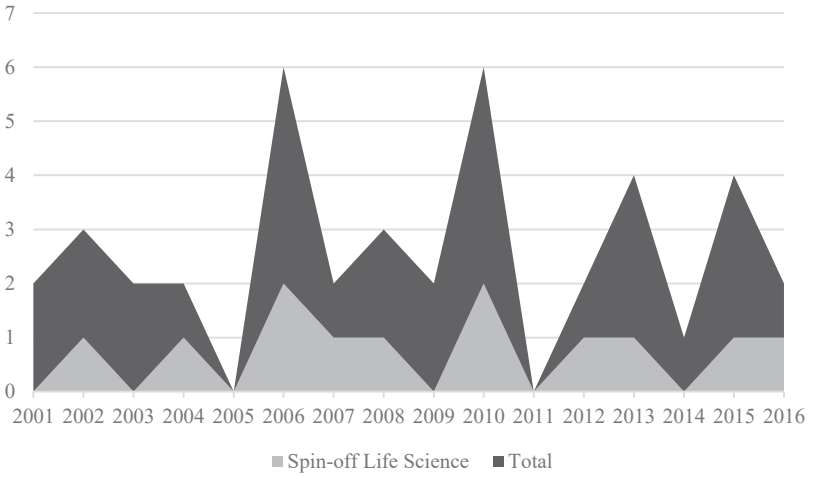
Figure 3.



Source(s): Our elaboration on University data

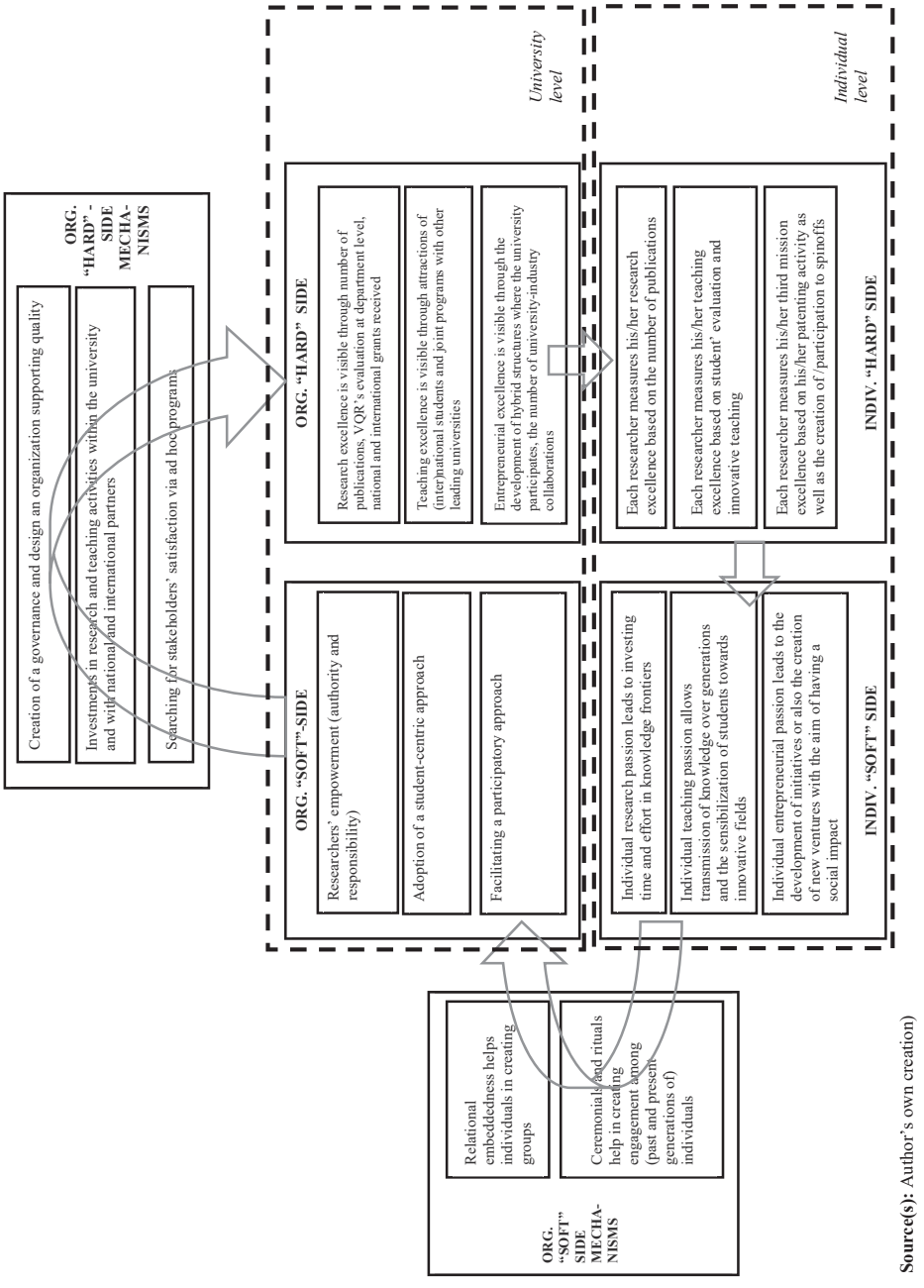
Figure 4.
Number of University of Siena's spin-offs

Internazionale di Biochimica, directed by Prof. Chain (one of the Nobel prizes for the penicillin). From this experience, he has understood the importance of how money is spent when doing research, of relational capital and interaction among people, and of investing in technologies and capabilities. These three factors characterized his modus operandi when, after his father Dario's death, he decided to come back to Siena:

> When I came back to ISTITUTO SCLAVO, I brought with me what I had seen. I had understood one thing: we needed to do biology with chemistry. This was almost unknown . . . The ISTITUTO was focused on cellular biology, it used animals . . . I organized a laboratory where I applied what I had learned in terms of techniques, applying them to vaccines, remembers Paolo Neri.

This multidisciplinary approach, which led to the combination of two different subjects such as biology and chemistry, was a cutting-edge and it won: this had been the first spark of the biotech. In 1970, led by his attitude, Paolo Neri decided to create the Sclavo Research Center (*SRC*), a sort of university branch within the ISTITUTO SCLAVO, aimed at exploring new research frontiers. Paolo Neri was seeking for excellence in research. All in his group, citing a few Francesco Cocola, Massimo Porro and Rino Rappuoli, had to spend a research period abroad, in universities such as Harvard and Rockefeller, and to come back with the learnt experience. What was important for him was that these persons not only get exposed to contamination in terms of scientific research, but also to new methods of working. Education and research were at the core.

Indeed, Prof. Neri, boosting his educational model into UoS, appointed a young, newly graduated biological sciences scholar, Dr. Annalisa Santucci, as the key responsible in organizing a lab within the Chemistry Department (1980). From that moment, this university lab and the SRC worked tightly, thus generating several scientific contributions. Simultaneously, many researchers of the SRC decided to fund their own start-up. In 1980, Francesco Cocola, one of the first researchers in SRC, created DIESSE Diagnostics (a firm with a turnover of +20 million euros). Similarly, in 1988, Massimo Porro, grown up within SRC and UoS' alumnus, founded BiosYnth, "*a biotech company focused on the discovery of novel synthetic and semi-synthetic molecules for application as human vaccines in the prevention of serious bacterial diseases*" (Massimo Porro, LinkedIn profile). The linkages among the UoS, the SRC and start-ups, are highly documented, as also represented by joint publications.



Source(s): Author's own creation)

Figure 5.
Grounded model

At the beginning of 1990s, other academics created their laboratories finding at UoS a fertile soil. Prof. Cecilia Anselmi, for example, arrived at the Faculty of Chemistry during 1970s. With a passion for cosmetics sciences, she was the pioneer of a specialization course that nowadays has generated several start-ups and a spin-off, UNICOSME-SI. Prof. Anselmi was specialized in chemistry. As she told us, cosmetics sciences were not considered at the same level of chemistry, they were like the tail-end of chemistry. Hence, she started gradually, with classes in cosmeceuticals (i.e. cosmetics and therapeutics), then a school of specialization (such as a 2 years-master) and finally the first PhDs in mid-1990s. The relationships with the other institutions in the Siena area were not so strong, being the territory consecrated to vaccines. However, as she told us, multidisciplinary was essential in the development of the teaching and entrepreneurial activities: research areas such as micro-biology for preservation of cosmetics and dermatology for testing were crucial.

Meanwhile, the ISTITUTO SCLAVO began to be prey of multinational enterprises (MNEs) acquisitions. In 1992, it was acquired by Chiron Corporation, in 2006 by Novartis International AG (that created Novartis Vaccines and Diagnostics and Novartis Pharmaceuticals) and finally, in 2016 by GSK that has created GSK Vaccines. It is interesting to note that, over those acquisitions, Rino Rappuoli was the head of Research and Vaccines under Chiron Corporation (1992), then General Research Director of Novartis Vaccines and Diagnostics (2006) and finally, since 2015, head of R&D Vaccine division of GSK. Dr. Rino Rappuoli has been probably one of the most prolific researchers, with 1293 contributions (Google Scholar, 28/6/2021). With a strong research passion of immunology and vaccines, nowadays he is considered as the co-founder of cellular microbiology and the pioneer of the so-called reverse vaccinology. Dr. Rappuoli has also been part of Scientific Committee of TLS Foundation since 2016.

4.2 From the individual to the university: the organizational "soft" side mechanisms

The analysis emphasized two main mechanisms that facilitated the transmission of excellence from the individual to the university over time.

The first one is the role of relational embeddedness that has helped individuals in creating trustworthy relationships at group level. This has been facilitated by the small dimensions of the city, and the connection among individuals and local institutions, in particular the city bank (Monte dei Paschi bank) and its direct connection with ISVT. Furthermore, the historical city has always presented moment of aggregation and attention to traditions that have been espoused by researchers. For example, there is a long tradition related to the horse race known as Palio. Traditions also inspired researchers in how to organize their activities. For example, during the years while Paolo Neri was leading the Sclavo Research Center, he tried to educate researchers, inspired by Alumnati: the first Alumnato, an ante-litteram Erasmus programme, established in Siena in 1724 thanks to the bequest of Marcello Biringucci (Monelli, 2007). Finally, retired professors have tended to maintaining relationships with the youngest generations via, for example, their witnesses during academic courses or writing books of experiences or participating to city events.

The second mechanism was related to the establishment of ceremonials and rituals related to the academic life. As example we can cite the adherence to events such as "La Notte dei ricercatori" within the Bright EU program, the Graduation Day (an event that embraces students with their families thus creating shared experiences and memories), and USiena Alumni, an association launched by one of the former graduates of UoS and that nowadays count more than 15,200 members. Among the several activities launched by Alumni, we can mention the mentoring program that helps current students across several departments in pursuing their career counting on a mentorship program held by volunteering alumni who are now working in several contexts (academy, industry, public administrations, both at national and at international levels).

In such a context, knowledge has diffused quickly, and the several connections among individuals and institutions have generated chances of employment, boosted opportunity recognitions and helped the nurturing of the whole university-research centric cluster.

4.3 The organizational "soft" side

When moving from an individual to a group-level dynamic (and eventually university), we noticed that three "soft" dimensions emerged at organizational level (university) over the years.

The first one is related to the *researchers' empowerment that allows the flourishing of new collaborations with national and international scholars for promoting research activities*. This seems to emerge by far when, for example, full professors, such as prof. Neri, left their collaborators free to organize their laboratories and participate to grants, thus assuming responsibility of their work. Prof. Santucci is very clear in remembering her first objective:

> Prof. Neri just told me: 'Do you see? This is the room where there will be the new lab. It's empty.

Furthermore, researchers' empowerment is also reached thanks to the fact that they are highly educated and may remain updated via training (e.g. participation to summer/winter schools), comparison at conferences and their aimed-to-be tenured positions within the academia.

Finally, the researchers' empowerment is also boosted by a sane competition at individual and group level within and across the departments following the university's support via programs such as individual or group financial grants, as recently demonstrated by financing programs such as F-CUR.

The second "soft" dimension is represented by the *adoption of a student-centric approach*. This results from several aspects that characterize the relationships between university and students. For example, there is a very close interaction between professors/researchers (but also staff) and the students that derives from a very high ration students/teachers, the closeness of the university facilities (e.g. classrooms that are easy to reach and very close to each other within the same discipline that helps the connection not only between students but also between students and professors). Then, there are several activities carried on by the university in order to make new students part of the academic community, such as in the case of *Welcome day*. Finally, there are several activities that the university has put in place for facilitating students' knowledge such as libraries and introductory courses (e.g. Corso zero), but also support them in the several aspects of their academic life such as via housing services and financing programs.

The third "soft" dimension refers to the facilitation of *a participatory approach*. This is reached via the active engagement of the student community, the scholars and non-teaching staff who are surveyed over specific topics and whose opinions are collected via voting systems and creating dialogues. Then, the university also organizes conferences and round tables over specific topics. For example, there have been presentations and focus group about the extent to which small- and medium-sized enterprises in the life sciences have adopted industry 4.0 technologies with the aim to sensibilize external stakeholders. Relationships among academic scholars and industrial partners facilitate the development of entrepreneurship and opportunity emergence. For example, one company that was involved in the abovementioned event took the occasion for involving the university in the development of a market for one of its licenses.

4.4 From the organizational "soft" side to the organizational "hard" side: the organizational "hard" side mechanisms

Over the decades, while the surrounding environment was evolving following acquisitions of firms (e.g. Sclavo), nearly bankrupted banks (Monte dei Paschi's crisis), new scientific

discoveries, new technologies and worldwide megatrends, the UoS creates a governance and designs an organization able to support scholars and the several stakeholders in facing the changing environment. In particular, we would like to mention the commitment of Rector's delegates to the core aspects of teaching, research and technology transfer. Especially, starting from 2000s, the UoS has represented a key player in a more institutional development of the whole life sciences cluster (Pucci and Zanni, 2016). It is important to underline how the University, despite the financial crisis following 2008, has been able in the last decade to plan a strategy able to support and empower the cluster. From one side, the University tried to empower the technology transfer towards the productive environment, first involving existing companies (small local companies as well as huge MNEs) into a "virtual" environment in which knowledge transfer and contamination are highly supported and encouraged, and secondly pushing academic entrepreneurship. In particular, the latter has had two effects. On the one side, it has allowed the translation of academic knowledge into something worthy by the market. On the other side, it has supported young researchers (i.e. PhD, post-doc researchers) giving them a possibility to keep working with the research group without forcing them to leave Siena. The companies in the territory have had the possibility to access some technologies and knowledge at the frontier, which would not have been available otherwise, while the whole environment has benefited from keeping locally high skilled people.

The University has supported TLS planning other strategies, too. In terms of human resources, the University has transmitted knowledge and competencies from its own administrative offices and academic labs towards TLS. If it is true that this behaviour partially has weakened the University itself, since it has lost the possibility to benefit from human capital that highly contribute to build, at the same time it has strengthened the whole system, thus receiving an indirect benefit. The role of the University in giving power to TLS has not been limited to the transfer of human resources only, but it has also involved the strategic management of TLS. Having been both in the board of administrators and in the scientific board of TLS, the University has paid a significant effort in helping the TLS Foundation in overcoming a critical period such that after the Monte dei Paschi's crisis. Without the generous financing and the significant power exert by the MPS Foundation, TLS faced the risk to lose its importance. The University then has used its relational knowledge and capabilities to ensure the evolution of the local cluster: from a regional actor, TLS turned to be a national cluster with the help of the Tuscany Region and the crucial work of the University.

Lastly, in term of time yet not of importance, the empowerment of inter- and cross-disciplinary initiatives in which the University has a leading role with the goal of building the leadership of TLS in significative new sectors. Among others we can report the SAIHub partnership, where the University was one of the founders and the linked initiative, internal to the University, for the creation of a network of researchers belonging to all the Departments dealing with Artificial Intelligence with a special focus on Life Sciences.

Finally, the UoS has organized for quality via creating or shaping offices aimed at assuring quality as in the case of Quality Assurance, helping grants and research at national (e.g. PRIN) and international (e.g. Horizon 2020, Horizon Europe) levels as in the case of *Research and grants management Division,* and supporting established as well as newly formed firms via the creation of its technology transfer office (called *Liaison Office*), supporting UoS' spinoffs. Figure 4 shows the number of spinoffs of UoS and those of them that are related to the life sciences.

Secondly, the UoS *invests in research and teaching activities within the university and with national and international partners.* This is reached by joint publications among scholars as well as joint labs that represent instances of team working. For example, a multidisciplinary approach has been fundamental for implementing the research groups and the various

courses, especially at the PhD level, linking notion regarding economics and management to chemistry and biology. Indeed, as professor Santucci said:

> multidisciplinarity is fundamental, especially nowadays. In my past experience, I had to learn to recycle myself several times and hence to learn several, different things . . . It has not been easy at all, but this has allowed me to have a vision of the several scientific problems today.

Multidisciplinary has been important also for the development of Cosmeceuticals. In her interview, Prof. Anselmi stresses how important are laws and marketing knowledge beyond dermatology and other more chemistry-related knowledge.

The design of new teaching activities is also evident in the creation of Fondazione ITS (Istituto Tecnico Superiore per le nuove Tecnologie per la Vita) VITA, born in 2015 with the aim of education and training in the pharmaceutical, biotech and medical devices fields. In particular, the Foundation has promoted one course IFST and 6 courses for the chemical-pharmaceutical supply chain.

Furthermore, professors are judged considering the three pillars of university (research, teaching and third mission). This judgement depends on the stage of career of individuals, where junior faculty members are usually spurred to dedicate more attention to the research, while senior scholars are expected to contribute a lot also on the so-called third mission, which embraces from the creation of spinoffs to the public engagement via participation to and organization of civic events.

Third, the university is *searching for stakeholders' satisfaction via ad hoc programs*. With stakeholders we meant the industry, the faculty and the students. For what concerns the industry, the university has developed industrial PhDs, but also paid attention to its academic spinoffs' clients. For what concerns the faculty and the students, the university allows information flows and analysis of data via, for example, emails dedicated to inform the community about the decisions taken at central level, as well as the so-called *Nucleo di Valutazione* that is composed by not only UoS's faculty and students' representatives but also external professors and representatives of the Tuscany Region.

4.5 The organizational "hard" side

We distinguished among those tangible outcomes that could be representative of the three missions of the university. First, research excellence is visible through number of publications, the national evaluation of research (VQR) at department level, national and international grants received. This is particularly evident whether we consider the Departments include, among others, a significative number of star scientists.

Teaching excellence is visible considering the number of new courses introduced, the attractions of (inter)national students and joint programs with other leading universities, such as in the case of double degrees. For example, the Department of Excellence in Biotech, Chemistry and Pharmacy has launched a new master's degree in Sustainable Industrial Pharmaceutical Biotechnology "[is] *the first European example of higher education aimed at creating an innovative professional in the biotech and chemical sector*" (Brusa, 2020, p. 1). As Prof. Santucci said:

> we want to get out of conventional didactic schemes and focus heavily on the involvement of the industrial and extra-academic world on issues that cannot be covered by conventional study courses. Our ambition also lies in the desire to build a new integrated and flexible training model (in Brusa, 2020, p. 5).

Finally, entrepreneurial excellence is visible through the development of hybrid structures where the university participates. Aware of the strategic role of life sciences for the territory, in 2002 the UoS participated to the *Comitato di Indirizzo (Steering committee) Siena Life Sciences* together with other stakeholders. This was the first step towards the identification of

strategic guidelines and the execution of a biotech cluster around Siena (TLS website). In 2004, the UoS also participated to the creation of *Fondazione Toscana Life Sciences*, a further step towards the future Tuscan Life Sciences cluster, which saw probably for the first time, the joint forces of all the Tuscan Universities, Siena institutions and the Tuscan Region. Moreover, in 2012, TLS Foundation was involved in the Regional Technological Cluster of Scienze della Vita and, consequently, in the national technological cluster of Life Sciences, ALISEI (Advanced Life Science in Italy).

4.6 The individual "hard" side

The individual also presents a "hard" side that is constituted by how he/she measures his/her performance. This happens with respect to individual research excellence, as demonstrated by the quality of publications and their number. The quality and number of publications are important when applying for research grants at national and international levels. For example, the Department of Biotechnologies, Chemistry and Pharmacy has 19 active national projects and 4 active international projects. It is interesting to know how, over a permanent group of 65 scholars among researchers, associate professors and full professors, 16 of them are actively involved in research projects as coordinators.

For what concerns the teaching excellence, we can measure it via analysing the students' satisfaction about single courses and degrees. As mentioned, there has been the development of a new master's degree whose launch has happened during the Covid-19 pandemics.

Finally, each researcher could contribute to the society via the development of spinoffs and patenting activity. An interesting episode could be mentioned looking back to about a decade ago, when there was a period of crisis for UoS due to lack of financial resources following the crisis of Monte dei Paschi bank. This was the case, for example, of SetLance, the start-up founded in 2009 by Prof. Luisa Bracci and some of her researchers. The university was almost collapsed. Financing new entrepreneurial activities was very difficult, especially in life sciences–related research, where research is very expensive and risky. Nonetheless, aware of the importance of her research team, Prof. Bracci decided to start SetLance, an innovative start-up based on peptide research. Similarly, also the already mentioned UNICOSME-SI was created during those years.

5. Discussion

Past research on the "soft" and "hard" sides of TQM has mainly emphasized these dimensions alone (e.g. Cavallone and Palumbo, 2022) or, when looked at their interdependencies, has done it adopting quantitative approaches (e.g. Nasim, 2018; Rahman and Bullock, 2005). On the contrary, little is known about how TQM philosophy may influence the development of an organizational excellence over time, and, in particular, how it diffuses within the organization. From the analysis carried out on UoS research-centric life sciences cluster, we propose a grounded model (Figure 5) looking at how the "soft" dimensions of TQM trigger its "hard" dimensions considering them at the individual (micro-) and the university (meso-), and eventually at cluster (system-) levels.

Our findings emphasize the importance of a previously under searched micro-level (individual) "soft" dimension that helps in pursuing academic excellence: individual academic passion. Passion has been identified as an important concept in management and entrepreneurship fields, being a driver of entrepreneurship (Cardon *et al.*, 2009; Casprini *et al.*, 2020), especially when it is domain-specific (Milanesi, 2018). Furthermore, scholars have also investigated how it is contagious within a team (Cardon, 2008; Cardon *et al.*, 2017). Our findings add to this stream of research showing how individual passion in university is made up by three sub-dimensions. First, we define *individual research passion* as that emotion

motivating a researcher to conduct academic research (on his/her field of research). Academic research is usually focused on a specific field. In the case described, all our actors have a research passion: Achille Sclavo for the anti-anthrax serum, Paolo Neri for biochemistry, Rino Rappuoli for immunology, Francesco Cocola for in vitro diagnostics, Prof. Bracci for biology and Prof. Santucci for biochemistry. The role of research passion has nurtured the UoS research-centric life sciences district. For example, Achille Sclavo saw UoS as the main actor in pursuing scientific research and diffusing (through education) this scientific research within the wider social context. This research passion pushed the creation of ISVT that was conceived as supporting the production of his scientific discoveries. But research passion has been important also during the later generation of (academic) researchers. The research passion of Prof. Paolo Neri in biochemistry first pursued him to study in the most important centres (at least in Italy), then to create the SRC when he came back to Siena, then to engage in academia. A research passion that was transmitted to Prof. Neri by his grandfather, as he said during the interview:

> I have inherited passion, somehow. I'm born and grown up in the myth of my grandfather.

Moreover, Prof. Neri was able to transmit the same crave for research to his students. The transmission of research passion is clear in the case of Prof. Luisa Bracci and Prof. Santucci who continue to do high level research within the university, but also of Dr. Rino Rappuoli and the others who are continuing doing research within industry. All these actors have grown up advancing the previous knowledge of their ancestor. This is the natural path of academic research: adding something new to what we already know. Moreover, these actors have been leaders of their following research groups. Each of them has an own (research) team and lead the team through what he/she has learned from his/her mentor. To a certain extent, we can argue that most of their research team members may trace their ancestry back to Prof. Sclavo through Prof. Neri and through Prof. Neri's alumni (see Figure 1).

Second, we define *individual teaching passion* as that *emotion motivating a researcher to transfer knowledge through teaching activities*. This reflects the first mission of the University, and it is based on the interaction with students. In our case, the teaching passion characterized Prof. Sclavo, Prof. Neri and the other professors, Santucci and Bracci, who remained at the University. The importance of teaching passion pushed Prof. Sclavo in disseminating his results at all scholastics (and beyond) levels. Prof. Neri do have teaching passion. As he remembers, his grandfather was a follower of John Dewey's theories on progressive education, which emphasize learn by doing: what he has done during his life with his team. To understand how Prof. Neri has taught, his following key quotation must be cited:

> I said the 'what', but not the 'how'.

In other terms, the modalities through which reaching specific objectives, cannot be taught, but must be chosen and learnt by those who have to reach those objectives. Today, Prof. Neri continues to bring his experience to students participating to events organized by students' associations.

Finally, linking to extant studies (Cardon *et al.*, 2009), we define *individual entrepreneurial passion* as that emotion motivating a researcher to create and grow a venture. When looking at universities, entrepreneurial passion can take several roles. If considering our case, entrepreneurial passion has increasingly grown in terms of researchers' interests. At the very beginning, entrepreneurial passion was instrumental to the research and teaching passions. This is clear for Prof. Sclavo who founded ISVT mainly for pursuing an activity, that of production, that could not be pursued within the university's walls. Over time, entrepreneurial passion has become increasingly important. Prof. Neri well documents how important has been the entrepreneurial spirit for his team:

> Annalisa [Santucci] has come a long way alone, with her own value. Her scholarships, her grants . . . searching for grant. We need this, also. One who wants to do research and is in charge of a team must find money because he is like a head of a business. This sense of managing a group, a department as if it was a business is what the university could do too.

Moreover, *individual entrepreneurial passion* has been predominant in other researchers, such as Dr. Cocola and Dr. Porro, but also in the cases of Liquidweb and VisMederi (2009), as described in Pucci and Zanni (2016).

The importance of individual passion for the cluster development and the linkage with the territorial heritage about vaccines is finally clear also when looking at other companies such as Philogen, a Swiss-Italian integrated biotech company, founded by Dario, Duccio and Giovanni Neri, prof. Sclavo's great-grandchildren, and AchilleS Vaccines, founded by Riccardo Baccheschi.

Our research sheds also light on two mechanisms that help the development of UoS research-centric cluster: the "relational embeddedness" and the "ceremonials and rituals". The concept of embeddedness has a long history in management research being traced back to Granovetter (1973). Our case study shows that structural and relational embeddedness (Gulati, 1998; Moran, 2005), as represented by the connectedness among people who live in the same city as well as those scholars who have maintained relationships with the UoS after their retirement, are an important way for bonding individuals in groups, thus linking the individual with the organizational "soft" side. For what concerns ceremonials and rituals, Islam and Zyphur (2009) notice that the need for stability and for transformation lead to a ritual episode and that the ritual episode helps in establishing role identities, in fixing values, beliefs and norms, and in establishing paradigm change. However, extant studies have noticed that often ceremonial behaviours are mainly used for promotion rather than embraced within the organization. For example, Boiral (2007) looked at how organizations has adopted ISO 14001 standards, but whether on the one side these organizations meet the technical and administrative requests, on the other side employees do not understand them. Our case shows that ceremonials and rituals, as well as the creation of associations that organize and sponsor them, are a mean for linking individuals over time, thus allowing past and present generations of individuals in nurturing the whole organization.

Furthermore, TQM research highlights the importance of leadership and employees' involvement in reaching quality. Our case presents an in-depth description about researchers' empowerment to take over research projects. Empowering researchers helps them in pursuing that individual freedom often felt as triggered by TQM (Koch, 2003). Our findings also enrich recent research that has emphasized the importance of participatory approaches for the integration of new concepts in an organization, such as in the case of sustainable universities (Disterheft *et al.*, 2015).

In addition, our research also explains how the organizational "soft" side results into tangible results as represented by the organizational and also individual "hard" sides. The university, in fact, has designed an organization that supports quality in research, teaching and third mission. In particular, it has developed some departments over time in order to support individual contributions, students, and also deal with the several stakeholders in the territory and beyond. These mechanisms trigger a virtuous circle as represented by the increase of research outputs (e.g. the new Research and Grant Office helps individual scholars in developing research proposals), which leads to higher visibility at national and international level about research excellence; the quality of teaching leads to attractions of talents, international students and joint programs with other leading universities; the continuous monitoring of the needs of the surrounding environment (e.g. looking at the needs of the main MNE in the territory, i.e. GSK) and the identification of new market needs, ends up with searching for new collaborations with third parties.

Our findings show that TQM philosophy, balancing both its "soft" and "hard" sides, in university is a mean not only for improving the employees' and students' satisfaction, delivering higher quality services for students and spinoffs' customers, for example, but also it contributes to the development of the research-centric cluster. Therefore, the grounded model that we propose adds a very nuanced description on the interplay between "soft" and "hard" sides of TQM that can be theoretically generalized. In fact, extant research has missed an integrative framework capable of explaining how "soft" and "hard" sides interact within higher education institutions. On the one side previous studies have focused either on a broader organizational view, often looking at a more administrative level, and in a conceptual manner (e.g. Holmes and McElwee, 1995). Then, these studies have missed the individual level that in our framework appears to be one key factor for boosting academic excellence. On the other side, extant research has either focused on the "soft" (e.g. Cucino *et al.*, 2022) or, more frequently, on the "hard" side that is often considered for evaluation purposes and accreditation (Calvo-mora *et al.*, 2005; Fernandes and Singh, 2022). Consequently, our paper bridges multiple aspects providing rich evidence on how academic excellence can be reached via considering both a multi-level (individual and organizational levels) and multi-dimensional (the soft and the hard sides of TQM) framework. Finally, it also introduces a further impact that academic excellence can have for the creation and the development of an internationally renowned cluster. Our case is focused on the Tuscan Life Science cluster, where the territory of Siena (characterized by the UoS, the TLS Foundation and GSK Vaccines) is recognized worldwide as a top player for the development of vaccines, but we invite scholars to adopt our model in other contexts characterized by research-based clusters. In fact, albeit our grounded model is generalizable in terms of the themes emerged, we think that different institutional contexts would present their own specificities in terms of individual and organizational soft and hard sides of TQM.

Indeed, our study is no without limitations. A first critique could be related to the fact that it relies on a single case study linked to one of the oldest universities worldwide and therefore someone could argue that it would be not easy to replicate. However, we think that the grounded model emerged (Figure 5) could be applied in other contexts where universities are at the core of the development of a research-centric cluster. In particular, we recommend adopting the intertwinement of hard and soft sides of TQM along all the three missions of the universities (i.e. education, research and third mission) and considering the three levels of analysis (i.e. micro-, meso- and system-levels). A second critique could be advanced with respect to the measurements of the TQM "soft" and "hard" side dimensions. Albeit we relied on extant research when refining the model, some of the dimensions emerged are not so familiar to TQM research. Of course, our single case study is an illustrative one (Siggelkow, 2007), and we consider that our model well bridges previous studies on TQM, passion, academic entrepreneurship and cluster development. Consequently, we recommend that future research extends our findings adopting and refining our model in different contexts, also recurring to multiple case studies.

6. Conclusion

The originality of this research relies on two main aspects. First, this paper explores how "soft" dimensions influence "hard" dimensions at micro-, meso- and, eventually, system-levels, thus transforming a university into the core engine of a world-class cluster. We think that the model proposed sheds light on the importance of balancing the "soft" and the "hard" sides at different levels. Second, this paper enlightens the importance of considering both "soft" and "hard" dimensions in all the three pillars of university excellence (namely education, research and third mission).

From a practitioner standpoint, our paper suggests the importance of TQM principles applied at universities' level in order to nurture all the individuals, the organization itself and the cluster over time. The detailing description of the mechanisms and the themes may help other universities in revising their current soft and hard sides dimensions of TQM. Managers and professionals in the higher education domain may use our framework to analyse what the institution is doing in order to support the individual and organizational "soft" sides, but also sheds light on the importance of balancing them with the individual and organization "hard" sides. Considering that extant studies have focused on the importance of higher education for preparing a skilled workforce, mainly focusing on the accreditation and ranking systems (e.g. see Fernandes and Singh, 2022, for the Indian system), we think that our contribution highlights the importance of understanding what motivates individuals (i.e. the role of individual passion) and how the organization can create an environment capable of nurturing them. For example, our findings suggest that managers should design an organization where not only researchers need to be empowered but also students and other stakeholders should be directly involved in shaping the university.

Furthermore, the model proposed may also be useful to policymakers in revising current evaluation criteria and understanding better impact of TQM philosophy on academic excellence. In fact, policymakers could benefit from our research since it describes the interplay between individual and organizational soft and hard dimensions of TQM of a successful case where the relationships among the local university and the surrounding actors have been able to create synergies to boost excellence in the life science field. Indeed, whether policymakers could also find interesting insights on the role of universities for the development of knowledge-based clusters such as the cases of University of Wisconsin-Madison and University of Illinois at Urbana–Champaign (Patton and Kenney, 2010) and the development of entrepreneurial communities such as in the case of University of Cambridge (Hyclak and Barakat, 2010), we think that our case well presents how a smaller university in a rural area (as compared to those universities in larger cities and more technological advanced regions or countries), despite the several periods of crisis, has been able to play a fundamental role in the development of an internationally renowned life science cluster thanks to TQM. Therefore, based on the longitudinal data we collected, we recommend policymakers to pay more attention to the "soft" dimensions of TQM and to identify ad hoc programs capable of nurturing them, also considering the contextual specificities.

Finally, based on the longitudinal data we collected, we also challenge academic managers and professionals as well as policymakers in thinking about the evolution of "soft" and "hard" sides of TQM. In a fast-changing world following the fourth industrial revolution and the recent pandemics, is blending individual and organizational "soft" and "hard" sides of TQM enough? Our model shows that there are some organizational soft and hard sides mechanisms that not only need to be considered taking a long-time view and contextual specificities (since they encompass time and space), but that need an involvement of several stakeholders.

References

Aguinis, H. and Solarino, A.M. (2019), "Transparency and replicability in qualitative research: the case of interviews with elite informants", *Strategic Management Journal*, Vol. 40 No. 8, pp. 1291-1315.

Ansari, S.M., Fiss, P.C. and Zajac, E.J. (2010), "Made to fit: how practices vary as they diffuse", *The Academy of Management Review*, Vol. 35 No. 1, pp. 67-92, Academy of Management.

Aquilani, B., Silvestri, C., Ruggieri, A. and Gatti, C. (2017), "A systematic literature review on total quality management critical success factors and the identification of new avenues of research", *The TQM Journal*, Vol. 29 No. 1, pp. 184-213.

Boiral, O. (2007), "Corporate greening through ISO 14001: a rational myth?", *Organization Science*, Vol. 18 No. 1, pp. 127-146.

Brusa, G. (2020), "Investire in competenze: il nuovo Master in lingua inglese di UNISI- Dipartimento di Eccellenza in Biotecnologie, Chimica e Farmaceutica diretto dalla prof.ssa Santucci", *Bespoke Biotech Advisory*, n. 07/20. Text available at: https://www.dbcf.unisi.it/sites/st13/files/allegatiparagrafo/16-04-2020/newsletter-7-2020.pdf (accessed 20 February 2022).

Calvo-mora, A., Leal, A. and Roldán, J.L. (2005), "Relationships between the EFQM model criteria: a study in Spanish universities", *Total Quality Management and Business Excellence*, Vol. 16 No. 6, pp. 741-770.

Cardon, M.S. (2008), "Is passion contagious? The transference of entrepreneurial passion to employees", *Human Resource Management Review*, Vol. 18 No. 2, pp. 77-86.

Cardon, M.S., Post, C. and Forster, W.R. (2017), "Team entrepreneurial passion: its emergence and influence in new venture teams", *Academy of Management Review*, Vol. 42 No. 2, pp. 283-305.

Cardon, M.S., Wincent, J., Singh, J. and Drnovsek, M. (2009), "The nature and experience of entrepreneurial passion", *The Academy of Management Review*, Vol. 34 No. 3, pp. 511-532, Academy of Management.

Casprini, E., Pucci, T., Vitale, G. and Zanni, L. (2020), "From individual consumption to venture development: the role of domain passion in the videogame industry", *Journal of the Knowledge Economy*, Vol. 11 No. 4, pp. 1470-1488.

Cavallone, M. and Palumbo, R. (2022), "Delving into the soft side of TQM: an analysis of the implications of employee involvement on management practices", *TQM Journal*, Vol. 34 No. 5, pp. 1096-1115, doi: 10.1108/TQM-05-2021-0148.

Compagnucci, L. and Spigarelli, F. (2020), "The Third Mission of the university: a systematic literature review on potentials and constraints", *Technological Forecasting and Social Change*, Vol. 161, 120284.

Cucino, V., Del Sarto, N., Ferrigno, G., Piccaluga, A.M.C. and Di Minin, A. (2022), "Not just numbers! Improving TTO performance by balancing the soft sides of the TQM", *TQM Journal*, Vol. ahead-of-print No. ahead-of-print, doi: 10.1108/TQM-01-2022-0034.

Dahlgaard-Park, S.M. (2011), "The quality movement: where are you going?", *Total Quality Management and Business Excellence*, Vol. 22 No. 5, pp. 493-516.

Dean, J.W. and Bowen, D.E. (1994), "Management theory and total quality: improving research and practice through theory development", *Academy of Management Review*, Vol. 19 No. 3, pp. 392-418.

Disterheft, A., Caeiro, S., Azeiteiro, U.M. and Filho, W.L. (2015), "Sustainable universities – a study of critical success factors for participatory approaches", *Journal of Cleaner Production*, Vol. 106, pp. 11-21.

Douglas, T.J. and Judge, W.Q. Jr (2001), "Total Quality Management implementation and competitive advantage: the role of structural control and exploration", *Academy of Management Journal*, Vol. 44 No. 1, pp. 158-169.

Dwaikat, N.Y. (2020), "A comprehensive model for assessing the quality in higher education institutions", *TQM Journal*, Vol. 33 No. 4, pp. 841-855.

Ershadi, M.J., Najafi, N. and Soleimani, P. (2019), "Measuring the impact of soft and hard total quality management factors on customer behavior based on the role of innovation and continuous improvement", *TQM Journal*, Vol. 31 No. 6, pp. 1093-1115.

Fernandes, J.O. and Singh, B. (2022), "Accreditation and ranking of higher education institutions (HEIs): review, observations and recommendations for the Indian higher education system", *TQM Journal*, Vol. 34 No. 5, pp. 1013-1038.

Fotopoulos, C.B. and Psomas, E.L. (2009), "The impact of "soft" and "hard" TQM elements on quality management results", *International Journal of Quality and Reliability Management*, Vol. 26 No. 2, pp. 150-163.

Gadenne, D. and Sharma, B. (2009), "An investigation of the hard and soft quality management factors of Australian SMEs and their association with firm performance", *International Journal of Quality and Reliability Management*, Vol. 26 No. 9, pp. 865-880.

Granovetter, M.S. (1973), "The strength of weak ties", *American Journal of Sociology*, University of Chicago Press, Vol. 78 No. 6, pp. 1360-1380.

Gulati, R. (1998), "Alliances and networks", *Strategic Management Journal*, Vol. 19 No. 4, pp. 293-317.

Holmes, G. and McElwee, G. (1995), "Total quality management in higher education: how to approach human resource management", *The TQM Magazine*, Vol. 7 No. 6, pp. 5-10.

Hyclak, T. and Barakat, S. (2010), "Entrepreneurship education in an entrepreneurial community", *Industry and Higher Education*, Vol. 24 No. 6, pp. 475-486.

Irfan, M., Thaheem, M.J., Kaka Khel, S.S.U.H., Faizan Ul Haq, M., Saeed Zafar, M. and Ehtsham, M. (2021), "Development of comprehensive coursework of quality management in universities pertinent to the construction industry: a case of Pakistan", *TQM Journal*, Vol. 33 No. 6, pp. 1100-1122.

Islam, G. and Zyphur, M.J. (2009), "Rituals in organizations: a review and expansion of current theory", *Group and Organization Management*, Vol. 34 No. 1, pp. 114-139.

Jasti, N.V.K., Venkateswaran, V., Kota, S. and Sangwan, K.S. (2022), "A literature review on total quality management (models, frameworks, and tools and techniques) in higher education", *TQM Journal*, Vol. 34 No. 5, pp. 1395-1415.

Kanji, G.K. and Tambi, A.M.B.A. (1999), "Total quality management in UK higher education institutions", *Total Quality Management*, Vol. 10 No. 1, pp. 129-153.

Koch, J.V. (2003), "TQM: why is its impact in higher education so small?", *TQM Magazine*, Vol. 15 No. 5, pp. 325-333.

Manatos, M.J., Rosa, M.J. and Sarrico, C.S. (2018), "Quality management in universities: towards an integrated approach?", *International Journal of Quality and Reliability Management*, Vol. 35 No. 1, pp. 126-144.

Milanesi, M. (2018), "Exploring passion in hobby-related entrepreneurship. Evidence from Italian cases", *Journal of Business Research*, Vol. 92, pp. 423-430.

Miles, M.B., Huberman, A.M. and Saldaña, J. (2014), *Qualitative Data Analysis: A Methods Sourcebook*, 3rd ed., SAGE Publications, Thousand Oaks, Califorinia.

Monelli, L. (2007), "Le opere d'arte della collezione Biringucci", *Il Giornale del Santa Maria della Scala*, n. 26, Anno VIII.

Moran, P. (2005), "Structural vs. Relational embeddedness: social capital and managerial performance", *Strategic Management Journal*, Vol. 26 No. 12, pp. 1129-1151, Wiley.

Motwani, J. and Kumar, A. (1997), "The need for implementing total quality management in education", *International Journal of Educational Management*, Vol. 11 No. 3, pp. 131-135.

Nasim, K. (2018), "Role of internal and external organizational factors in TQM implementation: a systematic literature review and theoretical framework", *International Journal of Quality and Reliability Management*, Vol. 35 No. 5, pp. 1014-1033.

Nasim, K., Sikander, A. and Tian, X. (2020), "Twenty years of research on total quality management in Higher Education: a systematic literature review", *Higher Education Quarterly*, Vol. 74 No. 1, pp. 75-97.

Orsini, D. (2016), *La Collezione Di Strumenti e Il Fondo Archivistico Dell'Istituto Sieroterapico e Vaccinogeno Sclavo. Mater.Iali 15*, Università di Siena, SIMUS, Betti Editrice, Siena.

Owlia, M.S. and Aspinwall, E.M. (1997), "TQM in higher education – a review", *International Journal of Quality and Reliability Management*, Vol. 14 No. 5, pp. 527-543.

Patton, D. and Kenney, M. (2010), "The role of university in the genesis and evolution of research-based clusters", in Fornahl, D., Henn, S. and Menzel, M.P. (Eds), *Emerging Clusters. Theoretical,*

Empirical and Political Perspectives on the Initial Stage of Cluster Evolution, Edward Elgar, Cheltenham, UK, pp. 214-238.

Pezzo, A. (2013), "Neri, Dario – Dizionario Biografico degli Italiani, Treccani", Vol. 78, available at: http://www.treccani.it/enciclopedia/dario-neri_(Dizionario-Biografico)

Psychogios, A.G. and Wilkinson, A. (2007), "Exploring TQM awareness in the Greek national business context: between conservatism and reformism cultural determinants of TQM", *International Journal of Human Resource Management*, Vol. 18 No. 6, pp. 1042-1062.

Psychogios, A.G., Wilkinson, A. and Szamosi, L.T. (2009), "Getting to the heart of the debate: TQM and middle manager autonomy", *Total Quality Management and Business Excellence*, Vol. 20 No. 4, pp. 445-466.

Pucci, T. and Zanni, L. (2012), *Scienza, Imprese e Territorio. Un'analisi Degli Attori e Delle Sinergie Locali per Lo Sviluppo Del Distretto Toscano Di Scienze Della Vita*, Edizioni Il Leccio, Siena.

Pucci, T. and Zanni, L. (2016), "Entrepreneurship and technological clusters: the influence of contextual factors on the birth and growth of new businesses", in Visintin, F. and Pittino, D. (Eds), *Fast Growing Firms in a Slow Growth Economy: Institutional Conditions for Innovation*, Edward Elgar Publishing, Cheltenham, UK, pp. 19-43.

Pucci, T., Zanni, L. and Fiorini, N. (2018), *Le Scienze Della Vita in Toscana. Il Governo Istituzionale e Imprenditoriale Dei Processi Di Sviluppo*, Towel Publishing, s.r.l.s., Pisa.

Rahman, S.-U. and Bullock, P. (2005), "Soft TQM, hard TQM, and organisational performance relationships: an empirical investigation", *Omega*, Vol. 33 No. 1, pp. 73-83.

Saleh, R.A., Sweis, R.J., Saleh, F.I.M., Sarea, A.M., Eldin, I.M.S. and Obeid, D.N. (2018), "Linking soft and hard total quality management practices: evidence from Jordan", *International Journal of Business Excellence*, Vol. 14 No. 1, pp. 49-86.

Siggelkow, N. (2007), "Persuasion with case studies", *Academy of Management Journal*, Vol. 50 No. 1, pp. 20-24.

Stuelpnagel, T.R. (1988), "Total quality management in business - and academia", *Business Forum*, Vol. 14 No. 1, pp. 4-9.

Unnikrishnan, P.M., Tikoria, J. and Agariya, A.K. (2019), "TQM to business excellence: a research journey (1985-2018)", *International Journal of Business Excellence*, Vol. 19 No. 3, p. 323.

Vannozzi, F. (2004), "Achille Sclavo e la società del suo tempo", in Maggi, S. (Ed.), *Cittadella Della Scienza. L'Istituto Sclavo a Siena Nei Cento Anni Della Sua Storia (2004-2014)*, Franco Angeli, Milano, pp. 21-37.

Wilkinson, A. (1992), "The other side of quality: 'soft' issues and the human resource dimension", *Total Quality Management*, Vol. 3 No. 3, pp. 323-330.

Wilkinson, A. (2004), "Quality and the human factor", *Total Quality Management and Business Excellence*, Vol. 15 No. 8, pp. 1019-1024.

Yin, R.K. (1994), *Case Study Research: Design and Methods*, 2nd ed., Vol. 5, SAGE Publications, Thousand Oaks.

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