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Technology Orientation: A Reassessment and a Future Research Agenda

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Abstract
Studies on technology orientation was started in the late 1990s in the strategic marketing management literature. Although strategic orientations were all recognized as firm level cultural-based terms, technology orientation was operationalized as a functional level concept in the quantitative studies. Moreover, considering the importance of technology in the new competitive era, technology orientation was understudied comparing with other strategic orientations. Just few quantitative articles include technology orientation as a variable, while none of them focuses on the concept solely. This paper summaries and compares quantitative technology orientation studies that have been published in business related refreed journals since 1997 in terms of adopted/constructed scales for measuring TO, research design headlines, which relations are tested, and which findings were reached. The gap in the literature is determined regarding to current conceptual and empirical works. Therefore, the aim of this study is to portrait the gap in the literature regarding to current conceptual and empirical works on and propose a multidimensional construct for technology orientation.

Keywords
Technology orientation • Strategic orientations • Multidimensional construct proposal

Teknoloji Oryantasyonu: Yeniden Değerlendirme ve Gelecek Çalışmalar için Ajanda

Öz
Teknoloji oryantasyonu ile ilgili çalışmalar stratejik pazarlama yönetimi yazınında 1990'ların sonlarına doğru ortaya çıkmıştır. Yazında stratejik oryantasyonlar firma seviyesinde kültür tabanlı kavramlar olarak ele alınsa da, teknoloji oryantasyonu ampirik çalışmalarda fonksiyonel seviyede işlevselleştirilmiştir. Ayrıca, günümüz rekabetçi ortamında teknolojinin önemi giderek artarken, teknoloj oryantasyonu diğer stratejik oryantasyonlarla karşılaştırıldığında daha az ele alınan bir kavram olarak gözükmektedir. Çok az sayıda niceliksel çalışmada bir değişken olarak ele alınmış olan teknoloji oryantasyonu, hiçbir çalışmada tek başına değerlendirilmemiştir. Bu çalışmada, 1997'den itibaren yapılmış olan teknoloji oryantasyonuna ilişkin işletme alan dergilerinde yayınlanmış çalışmalar, adapte ettikleri/oluşturdukları TO ölçekleri, araştırma dizaynı ana başlıkları, hangi ilişkilerin test edilmiş olduğu ve araştırma bulguları bağlamında ele alınmış ve karşılaştırılmıştır. Dolayısıyla, bu çalışmanın amacı yazında kavramsal ve ampirik çalışmalar arasındaki boşluğu ortaya çıkarmak ve teknoloji oryantasyonunun çok boyutluluğuna ilişkin bir yapı önermektir.

Anahtar Sözcükler
Teknoloji oryantasyonu • Stratejik oryantasyonlar • Çok boyutlu yapı önerisi

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Introduction

There is no generally accepted definition of strategic orientation (hereafter SO) since SO literature has evolved from two distinct disciplines: strategic management and strategic marketing management (Zhou and Li 2007).

From the strategic management point of view, SOs are strategies that firms keen on. This perspective mostly classified firm behaviors into patterns of decisions in their relations with competitors and outside the industry. Miles and Snow (1978), Venkatraman (1989), Morgan and Strong (1998, 2003), Camelo-Ordaza et al. (2003), Tan and Tan (2005), Guan et al. (2009), Joachim et al. (2011) and Johnson et al. (2012) are the representatives of this vein. Similarly, Porter's (1980) three main generic strategies- as known as cost leadership, differentiation and focus- also considered as SOs in some studies (e.g. Durand and Coeurderoy 2001).

The discipline of strategic marketing management acknowledges SOs as corporate culture or subcultures of a corporate culture. This vein of SOs grew out of market orientation literature. With additional contributions to the literature, this vein has enriched to a point that there are several mostly discussed orientations such as market orientation which also consists of customer orientation and competitor orientation (e.g. Kohli and Jaworski 1990; Narver and Slater 1990; Desphande and Farley 2004; Atuahene-Gima 2005), technology orientation (hereafter TO), entrepreneurial orientation (Covin and Covin 1990; Lumpkin and Dess 1996, 2001), learning orientation (Calantone et al. 2002; Baker and Sinkula 1999). There are also several studies that examine the combined effects of orientations and/or the interrelations of them (e.g. Gatignon and Xuereb 1997; Zhou et al. 2005; Yılmaz et al. 2005; Jeong et al. 2006; Liu et al. 2002; Hult et al. 2004; Horintha et al. 2011, Hakala and Kohtamaki 2010; Hakala 2011).

Hakala (2011) recently proposed that SOs might be adaptive mechanisms rather than corporate cultures. In his literature review study, Hakala (2011) organized different approaches and classify three different adaptive mechanisms based on studies conducted to analyze interactions of multiple SOs: orientations as (1) sequences in development- there is a best orientation, (2) alternatives to choose from- there is a best orientation depends on the contingency and (3) complementary patterns- there is a unique pattern of several orientations that fits.

Regardless of research streams and approaches, the effects of SOs on firm performance and competitiveness in the market are commonly accepted. SOs are defined as creating firm behaviours parallel with firm strategy to influence employee norms, beliefs and values in order to provide sustainable competitive advantage in the long run (Zhou et al. 2005). SOs of a firm mirror its operationalization of firm strategy in chasing for survival in competition (Sainio et al. 2012). SO of a business enterprise is a firm's strategic directions/choices to construct appropriate ways to

handle competition and to survive in the market (Narver and Slater 1990; Gatignon and Xuereb 1997). In other words, SOs characterize a notion that characterizes the appearance of a firm (Lynch et al. 2012), different views of thinking on how to perform the business (Li 2005).

TO is in the crossroads of strategic management and strategic marketing management and it is explained in a related manner but from different angels. There are few studies focused on the relation between technology and strategy interaction (e.g. Kantrow 1980, Morone 1989; Berry and Taggart 1994; Levy and Kuo 1991) however, they do not mention this technology-strategy relation as an orientation. Thus, some early works discussed the strategic use and importance of technology. However, they approached to the concept from strategic (technology) management point of view and did not consider the cultural-based points as in strategic marketing management literature. Morone (1989) did not mention the word "orientation" but used the phrase of "strategic use of technology" in his narrative study. According to his study, technology management consists of deciding on strategies of acquiring externally generated technologies and/or developed technologies as well as internally developed technologies and introducing these technologies into the use in all corporate functions throughout the firm. Even considering with the limitations, technology-oriented firms show similar nature to Miles and Snow's (1978) prospectors (Zhou and Li 2007). Prospector firms perform well in dynamic environments with their prime capabilities of finding and exploiting new product and market opportunities. They heavily invest in individuals who scan the environment for potential opportunities. They rely upon a management group who are keen on facilitation rather than control, deploy and coordinate resources among various decentralize units and projects. They require flexibility in its technology and administrative systems that emphasizes to adopt change. Furthermore, other than strongly keen on following changing technology, they also heavily depend on technological capabilities. This technological capability not only highlights the current use but also includes openness to possible future requirements (Miles et al. 1978).

Strategic marketing management stream handles several SOs. In most studies, a mixed effect of several orientations was in the focus, including TO or the interrelatedness of orientations was investigated (e.g. Gatignon and Xuereb 1997; Zhou et al. 2005, Hakala and Kohtamaki 2010). TO studies have not been investigated solely in the literature.

TO is one of the highly recognized SOs. TO, in a narrow sense, is considered in functional level as a reflection of technology-push approach in the current literature (Day 1998). TO assumes technological superiority favourable in the eyes of the consumers. By this means, TO is characterized by the degree of commitment to

R&D, acquisition of new technologies and applications of the latest technologies (Gatignon and Xuereb 1997).

TO from strategic marketing management point of view needs to be nourished with some considerations of strategic management. Therefore, this paper, at first, reveals how two stream, namely strategic management and strategic marketing management literature, handle TO. Second, reviews empirical studies on TO. Then, propose a new sight: a firm-level, multidimensional TO in the crossroads of strategic management and strategic marketing management.

Construct of Technology Orientation

Technology is a combination of software -know-how which indicates knowledge to find solutions for practical problems- and hardware -tools and artefacts used in reaching the solutions- (Berry and Taggart 1994). Morone (1989) made a clear statement about strategic use of technology. He denoted that many firms are confronted by a range of technology-based opportunities like cooperative R&D endeavours, internal technology advancement; possible joint ventures/licensing agreements, industry-university research-center collaborations or entrepreneurial start-ups etc. The question was stated as why just few of them are successful to build upon technology-based strategies while most of them fail. Thus, he asserted that strategic use of technology is to find out advantageous technological possibilities among many and building a strategy upon appropriate opportunities and gain advantage over competitors.

"TO" was pronounced in the study of Gatignon and Xuereb (1997). Referring to common characteristics of innovative firms such as strong R&D background, proactiveness in technology acquiring and sophisticated technology use in production, Gatignon and Xuereb (1997) defined TO as employing technical knowledge in order to build a new technical solution to answer and meet new needs of the users. Furthermore, they described a technology-oriented firm with strength to acquire a sound technological experience and an ability to make use this background in development of new products. After Gatignon and Xuereb's study, many others have built on the concept by taking that study as a base.

TO covers adopting new technologies during the process of product development in defining the concept (e.g. Li 2005). However, when defining TO in such a context, TO seems to be synonym to innovation orientation. Levy and Kuo (1991) drew a line between technology and innovation orientations. As to their study, innovation-oriented activities were not necessarily need to include technological mastery or complexity where technology-oriented activities are those heavily engaged in high-tech applications or introduce a high-tech output at the end of the process. In this

regard, it is better to emphasize that the study of Levy and Kuo (1991) made a sharp distinction between innovation and TO. Innovation orientation refers to a firm's openness to new ideas and tendency to change which consists of new technologies, procedures and administrative systems (Hurley and Hult 1998; Zhou et al. 2005). TO on the other hand is knowledge and technology based organizational culture which aims to provide competitiveness through making decisions about (1) how to acquire which technology, (2) choosing among technology related strategic opportunities to fully utilize technological capabilities and (3) employing owned technology into the firm's functions including especially production process (Morone 1989; Gatignon and Xuereb 1997).

Firms, which are strongly keen on technology-push approach, assume that technological superiority is favourable in the eyes of the consumers. From the TO point of view "openness to new ideas" mostly means "employing state-of-the-art technologies". Technology-oriented firms are characterized by employing state-of-the-art technologies in their operations. Thus, these firms are considered to direct their resources heavily to R&D activities, be flexible in their production process, and be proficient in technical aspects. These specific characteristics are thought to provide a ground for breakthrough innovations. Breakthrough innovations have the potential to change basic consumer behaviours where to shape consumer preferences and create new markets (Zhou et al. 2005).

Technology oriented firms persist on chasing advances in technology and innovations while focusing on products rather than markets (Urban and Barreria 2010). In this regard, TO was considered as an internally focused orientation considering it is less related to customers or competitors (Gatignon and Xuereb 1997; Spanjol et al. 2012). Consequently, technology-oriented firms are more likely to rely on acquiring new technologies and building up technological new solutions to existing knowledge rather than sophisticated and continuous market research (Berry 1996; Spanjol et al. 2012).

TO is also referring to product-oriented management approach and expected to lead innovations that are more radical on the one hand. TO satisfy customers through technological solutions they introduce to the market, enlarge product range by presenting differentiated products and on the other hand gain cost advantages in production process by using high-tech, highly effective infrastructures (Hakala and Kohtamai 2010).

TO studies mostly investigated TO as a driver of new product innovation (e.g. Jeong et al. 2006; Gao et al. 2007; Hakala and Kohtamaki 2010, 2011; Jaferian and Rezvani 2014; Leng et al. 2015; Liu and Chen 2015; Salovarji et al. 2015). Stating differently, TO was basically acknowledged as main component of technological innovations and way of creating unique products. High degree of TO is more likely

to result in new products with a high degree of newness to customers (Salvaou 2005). Technology-oriented firms are more likely to engage in innovative products, customers at first may react to the products since they are beyond their imagination. However, firms may even turn such a situation into their best interest by introducing several side products and informative means to make customer getting used to the new products (Salvaou 2005).

On the other hand, it is expected to obtain cost advantages while innovation expenses are mostly disregarded (Gatignon and Xuereb 1997). Even though, a strong emphasize made on introduction of radical technological innovations by technology-oriented firms as pioneers, it does not necessarily result in huge success in terms of value creation. Moreover, it is also possible that followers or imitators that copy and modify first movers' technologies may even outperform first movers (Chen and Lien 2013). They explained the reason behind by being somewhat aware customers, reduced risks, large-scale manufacturing, ease in marketing and distribution. Therefore, TO not only composed of creating a new technology but also noticing a promising technology and imitating it in order to stay competitive. Although TO has its costs and baring much uncertainty in it, a rapid change in the environment would make the products out-of-date/old-fashioned/unnecessary then, TO may only be the way to survival (Hakala and Kohtamai 2010).

Research

Methodology

Considering the different point of views to TO from marketing and management veins, a detail review on the empirical studies of TO was decided to have strong importance to better understand how TO is operationalized. Review process started with keyword searches on well-known databases such as Academic Search Complete, Business Source Complete, EBSCOHost and ScholarGoogle. Primarily, the keyword (firm's)[1] TO was used. In searching scholarly peer-reviewed business journals'[2] articles comprising quantitative research, both in Turkish and English, the words were quested in title, abstract and keyword parts of the articles. Because pronouncing TO was started with Gatignon and Xuereb's (1997) study, time frame covers from 1997 to 2018. After running through thousands of results, 191 articles were detailedly reviewed and papers including TO as a variable on empirical studies were chosen for closer inspection. There were only 44 scholarly peer-reviewed quantitative research articles consisting TO at least as one of the variables where all these researches are also detailed in Tables 1, 2,

1 The attention in this study is on firm's TO, therefore, some studies which focused on, for instance, sales TO or TO for distance education or alike were eliminated.

2 According with the scope of this research, only referred business journals' articles were included where material science, engineering and alike journals were eliminated.

and 3 (Gatignon and Xuereb 1997; Zhou et al. 2005; Li 2005; Salavou 2005; Jeong et al. 2006; Gao et al. 2007; Akman et al. 2008; Hakala and Kohtamaki 2010; Zehir et al., 2010; Zhou and Li 2010; Urban 2010; Urban and Barreria 2010; Hortinha et al. 2011; Spanjol et al. 2011; Hakala and Kohtamaki 2011; Mu and Benedetto 2011; Sainio et al. 2012; Rajala and Westerlund 2012; Yang et al. 2012; Surer and Mutlu 2012; Al-Ansari et al., 2013; Hyung and Dedahanov 2014; Hsu et al. 2014; Chen et al. 2014a; Chen et al., 2014b; Jaferian and Rezvani 2014; Lee et al. 2014; Tsou et al., 2014; Al-Ansari et al., 2015; Batra et al. 2015; Costa et al., 2015; Lee et al. 2015; Leng et al. 2015; Liu and Chen, 2015; Nakola et al. 2015; Salovarji et al., 2015; Surer and Mutlu 2015; Ho et al. 2016; Ibrahim and Shariff, 2016; Kasim and Altınay, 2016; Mutlu and Surer 2016; Kocak et al, 2017; Mandal 2017; Aloulou, 2018).

A Closer Look to TO Studies

Although there was not any study solely studying TO, 44 articles investigated the relation and/or effects of combinations of strategic orientations on selected variables.

Table 1

Adopted scales for measuring TO

Referred sources for measuring TO	Studies adopted/composed from those referred sources in their studies
Gatignon and Xuereb 1997	Gatignon and Xuereb 1997; Li 2005; Gao et al. 2007; Zhou and Li 2010; Spanjol et al. 2011, Yang et al. 2012; Surer and Mutlu 2012; Hyung and Dedahanov 2014; Chen et al. 2014a; Chen et al. 2014b; Jaferian and Rezvani 2014; Lee et al. 2014; Batra et al. 2015; Lee et al. 2015; Leng et al. 2015; Surer and Mutlu 2015; Ho et al. 2016; Mutlu and Surer 2016
Gatignon and Xuereb 1997; Hurley and Hult, 1998	Zhou et al. 2005; Mu and Benedetto 2011
Gatignon and Xuereb 1997; Zhou et al. 2005	Hsu et al. 2014
Zhou et al. 2005	Hortinha et al. 2011; Sainio et al. 2012; Costa et al. 2015; Salovarji et al. 2015; Kocak et al. 2017
Ettlie 1983	Salavou 2005
Drozier 2003	Hakala and Kohtamaki 2010; Hakala and Kohtamaki 2011; Aloulou 2018
Gartner et al. 2004; Allen and Stearns 2004	Urban and Barreria 2010; Urban 2010
Alloca and Kessler 2006; Aragon-Sanchez and Sanchez-Marin (2005); Salavou et al. (2004)	Al-Ansari et al. 2013; Al-Ansari et al. 2015;
Spanjol et al., 2011	Ibrahim and Shariff 2016
Salavou 2005	Liu and Chen 2015
Antioco et al. (2008), Lytle et al. (1998), Zhou et al. (2005) and Gatignon and Xuereb (1997)	Tsou et al. 2014
Barzack (1994)	Zehir et al. 2010
Not specified	Jeong et al. 2006; Akman et al. 2008; Rajala and Westerlund 2012; Nakola et al. 2015; Kasim and Altınay 2016; Mandal 2017

In those quantitative articles, the main source for measuring TO is seen as Gatignon and Xuereb (1997)'s study. As in Table 1, eighteen studies directly referred to study of Gatignon and Xuereb (1997) where another four mentioned their scale with other studies. Zhou et al. (2005) adopted an instrument, which was mostly based on Gatignon, and Xuereb's (1997) instrument, while a bit mixed with innovativeness and two following studies adopted this instrument in their studies. Thus, while counting all these instruments came from mostly same source it can be said that the instruments of 29 out of 44 studies were originated from Gatignon and Xuereb (1997). On the other hand, six studies only mentioned that they draw instruments from the current literature but did not gave an exact source. All studies except one (Rajala and Westerlund 2012) considered TO as a single-dimensional construct. Rajala and Westerlund (2012) proposed a two-dimensional-construct of TO. They claimed that TO should be investigated both as firm's responsiveness to technological change and as firm's technological capabilities. The first one is referring to exogenous environment where the latter is addressing to endogenous environment (Rajala and Westerlund 2012). However, they did not mention how they operationalized these two dimensions. In addition, not including any information about the instruments they used and a valid factor analysis results; there is no indication of the effects of those dimensions on dependent variables.

In Table 2, research designs of the selected papers were summarized. As indicated in the Table, firm or Strategic Business Units (SBUs) were the level of analysis in all studies as expected. One also chose project team as level of analysis. The selected methods for data gathering by using questionnaires were survey and/or interview. These quantitative studies were mostly conducted in China (10 out of 44). Excluding ten studies (five conducted in Finland, and two in the USA, two in Portugal and 1 in Germany), all the others focused on emerging markets (10 in China, six in Turkey, three in South Korea, three in Taiwan, two in South Africa, two in Dubai, two in India, one for each in Greece, Iran, Kenya, Nigeria, Malaysia and Saudi Arabia). Another point in the studies is respondents were mostly preferred among CEOs, owners or senior managers/staffs.

Table 2

Research design headlines for the selected studies

Studies	Data gathering method	Level of analysis	Respondents	Conducted country
Gatignon and Xuereb 1997	Survey	SBU	Marketing executives; 309 participants; 14% response rate	USA
Li 2005	Interview/ survey	Firm	Local senior managers of foreign-invested-enterprises; 181 participants; 30.2% response rate	China
Salavou 2005	Interview	Firm	Top managers; 126 participants; 67% response rate	Greece

Zhou et al. 2005	Interview/ survey	Firm	Marketing managers; 350 participants	China
Jeong et al. 2006	Interview/ survey	Firm	Executives, 232 firms, 90% response rate	China
Gao et al. 2007	Interview/ survey	SBU	Marketing executives, marketing managers and product managers; 408 brands from 280 firms; 20% response rate	China
Akman et al. 2008	Survey	Firm	76 manufacturing firm	Turkey
Hakala and Kohtamaki 2010	Survey	Firm	Managing directors; 164 software firms; 13% response rate	Finland
Urban and Barreria 2010	Survey	Firm	229 respondants; 30.3% response rate	South Africa
Urban 2010	Survey	Firm	236 respondants	South Africa
Zehir et al. 2010	Survey	Firm	Istanbul stock Exchange firms, 84 participant firm	Turkey
Zhou and Li 2010	Interviews	SBU	One senior manager from each firm; 380 firms; 90.5% response rate	China
Hakala and Kohtamaki 2011	Survey	Firm	Managing directors; 164 software firms; 13% response rate	Finland
Hortinha et al. 2011	Survey	Firm	R&D and export managers of manufacturer exporter firms; 170 firms; 26% response rate	Portugal
Mu and Benedetto 2011	Survey	Project	Leading innovation companies; 348 participants	China
Spanjol et al. 2011	Survey	SBU	Marketing and R&D executives from personal and household products industry; 182 participants; 12.1% response rate	USA
Rajala and Westerlund 2012	Survey	Firm	Senior managers of 179 software firms; 197 participants; 13.2% response rate	Finland
Sainio et al. 2012	Survey	Firm	CEO, managing director; R&D managers or development officers; 213 firms; 37.4% response rate	Finland
Surer and Mutlu, 2012	Survey	Firm	144 firms	Turkey
Yang et al. 2012	Interview/ Survey	Firm	CEO, marketing, R&D and project managers; 501 firm; 20% response rate	China
Al-Ansari et al. 2013	Survey	Firm	SMEs from various industries; 200 participants (individuals with senior level responsibilities); 33.33% response rate	Dubai
Chen et al. 2014a	Survey	Firm	Manufacturing firms; 410 participants (198 CEOs and 212 top management team memebers); response rate: 71.2% for TMT and 76.3% for CEOs.	China
Chen et al. 2014b	Interview and Survey	Firm	Senior and middle managers of international joint ventures in consumer products industry; 156 participants; 39% response rate	China
Hsu et al. 2014	Survey	Firm	Information system industry; 117 participants; 23.6% response rate	Taiwan
Hyung and Dedahanov 2014	Survey	Firm	Technology-intensive SMEs; 347 participants; 37.4% reponse rate	South Korea
Jaferian and Rezvani 2014	Survey	Firm	Export chemical manufacturers, 186 senior export manager participants	Iran
Lee et al. 2014	Survey	Firms	Technology-intensive and innovation-oriented SMEs; 374 respondents; 37,4% response rate	South Korea
Tsou et al. 2014	Survey	Firm	IT companies; 160 manager respondents; 30% response rate	Taiwan

Al-Ansari et al. 2015	Survey	Firm	SMEs from a wide range of service and manufacturing industries; 200 participants (97% owners/managers; 3% senior staff); 33.33% response rate	Dubai
Batra et al. 2015	Survey	Firm	162 manufacturing SMEs; 56% response rate	India
Costa et al. 2015	Survey	Firm	manufacturer exporters operating in multiple technological industries; export and R&D managers, 170 participants; 25% response rate	Portugal
Liu and Chen 2015	Survey	Firm	118 respondents; 16,86% response rate	Taiwan
Lee et al. 2015	Survey	Firms	Technology intensive SMEs; 352 respondents; 35,2% response rate	South Korea
Leng et al. 2015	Survey	Firm	High-tech firms; 360 senior manager respondents; 45% response rate	China
Nakola et al. 2015	Survey and (for secondary data) reports	Firm	SMEs; 306 owner/manager respondents; 91,34% response rate	Kenya
Salovarji et al. 2015	Survey	Firm	R&D intensive firms, 209 respondents	Finland
Surer and Mutlu 2015	Survey	Firm	Exporter firms; 144 respondents	Turkey
Ho et al. 2016	Survey	SBUs	High-tech manufacturing industries; 766 participants (middle and senior managers); 4.98% response rate	Germany
Ibrahim and Shariff 2016	Survey	Firm	SMEs; 522 owner-manager participants	Nigeria
Kasim and Altınay 2016	Survey	Firms	Small and Medium Sized hotels, 254 participants	Malaysia
Mutlu and Surer 2016	Survey	Firm	Hospitals; 62 top executive participants	Turkey
Kocak et al. 2017	Survey	firms	SMEs; 818 participants; 81% response rate	Turkey
Mandal 2017	Survey	Firm	Different sectors involved with medical SCs; 276 senior professionals; 18,73% response rate	India
Aloulou 2018	Survey	Firm	Members of top management from several industries, 292 firms; 80.22% response rate	Saudi Arabia

In Table 3, dependent and independent variables of the studies were summarized. Except the studies of Urban (2010), and Urban and Barreria (2010), TO is named in independent variables. Again, except those two, TO is associated with performance, in which the researchers set several different performance criteria. However, those two studies, indeed, designed to examine the reliability and validity of the scales and only investigated whether those variables are significantly correlated to each other. It is obvious from the Table that TO was expected to be one of the determinants of several performance criterias of firms.

Table 3

Selected variables in the studies

Studies	Dependent Variables	Independent Variables
Gatignon and Xuereb 1997	Model A: Innovative performance Model B: Innovation characteristics (incl. product radicalness, product advantage, and product costs)	Model A: Firm resource, innovation characteristics (incl. product radicalness/ similarity, product advantage, and product costs), firm strategic orientations (incl. customer, competitor, and technology), and interfunctional coordination Model B: Firm resources, firm strategic orientations, and interfunctional coordination
Li 2005	Network building (incl. ties with government, and ties with business) and firm performance	Strategic orientations (incl. market orientation, technology orientation, and entrepreneurial orientation)
Salavou 2005	Product performance (incl. product newness to customer, and new product uniqueness)	Customer orientation, technology orientation, and learning orientation
Zhou et al. 2005	Organizational learning, types of innovations (incl. technology based, and market based), firm performance, and product performance	Strategic orientations (incl. market orientation, technology orientation and entrepreneurial orientation), and market forces (incl. demand uncertainty, technology turbulence, and competitive intensity)
Jeong et al. 2006	New Product Development Perf**or**mance (incl. Consumer acceptance, technical product performance, and profitability)	Internal factor (incl. organizational support), external factors (incl. market turbulence and technology turbulence), and strategic orientations (incl. customer orientation and technology orientation)
Gao et al. 2007	Business performance (incl. profitability, sales growth and product performance), technology turbulence (incl. average level and high Level), Competitive intensity, and Demand uncertainty (incl. average level and high level)	Customer orientation, competitor orientation, and technology orientation
Akman et al. 2008	Firm performance	Strategic orientations (incl. customer orientation, competitor orientation and technology orientation), firm strategy (incl. aggressive, reactive and proactive), and total quality management
Hakala and Kohtamaki 2010	Company performance	Entreprenaurial orientation, technology orientation, and customer orientation
Urban and Barreria 2010*	Entrepreneurship orientations, and technology orientation	Environmental hostility, and environmental dynamism
Urban 2010*	Entrepreneurship orientations, and technology orientation	Environmental hostility, and environmental dynamism
Zehir et al. 2010	Firm performance	Future orientation, technology orientation, IT investment level, IT usage, IT perception, IT at the decision-making process
Zhou and Li 2010	Adaptive capability, highly competitive intensity, and high demand uncertainty	Customer Orientation, Competitor Orientation, and Technology Orientation
Hakala and Kohtamaki 2011	Company performance	Entrepreneurial orientation, technology orientation, customer orientation, and organizational learning

Hortinha et al. 2011	Export performance	Strategic orientations (incl. customer relationship orientation, and technology orientation), innovation capabilities (incl. exploratory innovation, and exploitative innovation), and past performance (incl. low past ROA and high past ROA)
Mu and Benedetto 2011	New product commercialization performance (incl. new product advantage, new product newness, and number of new products introduced into the market)	Market orientation, networking orientation, entreprenurial orientation, technology orientation, organizational learning, and environmental dynamism
Spanjol et al. 2011	New product ideation (incl. Novelty, and Volume)	Market research behavior, customer orientation, technology orientation, and learning orientation
Rajala and Westerlund 2012	Firm performance (incl. market performance, and financial performance)	Service orientation, technology orientation (incl. firm responsiveness to technological change, and technological capabilities), openness of innovative activity, customer proximity, and product uniformity
Sainio et al. 2012	Radicalness of the firm's innovation output (incl. technological radicalness, business model radicalness, and market radicalness)	Firm-level strategic orientation, customer relationship orientation, and technology orientation
Surer and Mutlu, 2012	Export performance	Market orientation (incl. customer, competitor, and interrelational), e-marketing orientation (incl. cognitive, behavioral, and acceptance), entreprenurial orientation, and technology orientation
Yang et al. 2012	Product innovation performance	Business environment (incl. market growth (high/low), and competition intensity (high/low)), strategic orientations (incl. customer orientation, competitor orientation, interfunctional coordination, and technology orientation)
Al-Ansari et al. 2013	Firm performance (incl. customer satisfaction, sales growth, profit growth, ROI, market share)	Innovation and technology orientation
Chen et al. 2014a	Product innovation performance	CEOs' transformational leadership, corporate entreprenurship, and technology orientation
Chen et al. 2014b	Model 1 Differentiation capability	foreign parent equity control, foreign parent social control, customer orientation, technology orientation
	Model 2 Differentiation capability	COxequity control, COxsocial control, TOxequity control, COxsocial control, TOxCO
Hsu et al. 2014	New product performance (incl. market performance, and financial performance)	Market orientation, technology orientation, and technological capability
Hyung and Dedahanov 2014	Firm performance (incl. market share, and growth rate)	Market orientation (incl. customer, competitor, and interrelational), entreprenurial orientation (incl. risk taking, and proactiveness and innovativeness), and technology orientation
Jaferian and Rezvani 2014	Export new product success	Export market orientation, technology orientation
Lee et al. 2014	Firm innovativeness and firm performance	Market Orientation, Entrepreneurial Orientation, learning orientation and technology orientation

Tsou et al. 2014	Service delivery innovation and innovative competence	Proactive and responsive market orientation, technology orientation
Al-Ansari et al. 2015	Firm performance (incl. customer satisfaction, sales growth, profit growth, ROI, market share)	Market orientation, aalliance orientation and technology orientation
Batra et al. 2015	Firm performance (market share, profitability and productivity) and firm innovativeness	Industry appropriability and technology orientation
Costa et al. 2015	Model 1 Explotative innovation; exploratory innovation Model 2 Export performance	Technology orientation (moderating CSR) Explotative innovation, exploratory innovation and technology orientation (moderating CSR)
Lee et al. 2015	Innovation performance and financial performance	Technology orientation
Leng et al. 2015	New product innovation	Market orientation and technology orientation
Liu and Chen 2015	New product development performance	Market orientation and technology orientation (with mediating effect of product innovativeness)
Nakola et al. 2015	Firm performance	Customer orientation and technology orientation
Salovarji et al. 2015	Firm market performance	Customer relationship orientation and technology orientation, marketing- R&D cooperation
Surer and Mutlu 2015	Financial performance and marketing performance	Market orientation, e-marketing orientation, Technology orientation
Ho et al. 2016	Profitability	Market orientation, entrepreneurial orientation, relationship orientation and technology orientation
Ibrahim and Shariff 2016	Performance	Market orientation, entrepreneurial orientation, learning orientation and technology orientation with mediating role of access to finance
Kasim and Altınay 2016	Firm growth	Technology orientation with moderating effects of Market condition, learning orientation
Mutlu and Surer 2016	Performance and innovativeness	Market orientation, e-marketing orientation, technology orientation
Kocak et al. 2017	Innovation and firm performance	Market orientation, entrepreneurial orientation and technology orientation
Mandal 2017	Health care supply chain resilience	Development culture, group culture, rationale culture, hierarcial culture (with moderating role of technology orientation)
Aloulou 2018	Firm performance (incl. new product, the revenues and profitability from new products, financial profitabilty and growth)	Market orientation, entreprenurial orientation and technology orientation

*Those studies were designed to examine the reliability and validty of the scales and only investigated whether those variables are significantly correlated to each other. Therefore, there was not any sharp distinction between dependent and independent variables.

The positive effects of TO on product related performance criteria was supported in most studies. For instance, the direct effects of TO on product advantage and product radicalness (Gatignon and Xuereb 1997), product newness to customers (Salavou 2005), new product ideation novelty (Spanjol et al. 2011), product innovation performance (Yang et al. 2012), new product newness, new product advantage, and the number of products introduced to the market (Mu and Benedetto 2011) were revealed. In some studies, in the relation between TO and product related performance criteria, moderation and/or interaction effects were detected. For instance, TO effects (a) product performance indirectly through technology-based innovations (Zhou et al. 2005) or product innovativeness (Liu and Chen 2015), (b) product uniqueness through learning orientation (Salavou 2005), (c) product performance at the average level of technology turbulence (Gao et al. 2007), (d) product innovation performance larger under the high market growth and high competition intensity condition (Yang et al. 2012), and export new product success through the level of competitive intensity (Jaferian and Rezvani 2014). Product innovation performance is affected by CEOs transformational leadership, corporate entrepreneurship and TO, where the interaction of CEOs transformational leadership and TO is related to product innovation performance (Chen et al. 2014a). TO also leads to stronger differentiation capability when foreign equity control is higher or operational control is greater (Chen et al. 2014b).

The results also indicated that TO have direct or indirect effects on innovative performance criteria. For example, TO leads to superior innovative performance (Gatignon and Xuereb 1997; Mutlu and Sürer 2016), better technology-based innovations (Zhou et al. 2005) and, it is associated with exploratory and exploitative innovation positively (Hortinha et al. 2011). Costa el al. (2015) highlights that CSR principles enhance the impact of technology orientation on exploratory innovation. Technology-oriented philosophy is shown as a way to enhance innovative competence which leads to superior products/services to customers (Tsou et al. 2014). TO

A direct or indirect association between firm/business/company performances were also argued by most of the studies. For instance, Sürer and Mutlu (2015) remaks a positive relation between TO and financial performance where Nakola et al. (2015) highlights a positive relation between to and general firm performance. TO exerts a positive relationship on ties with business community, where a negative relationship on ties with government officials. Those ties lead to a better firm performance (Li 2005). Organisations that establish affiliation and cooperation with external networks to increase their opportunities and access to new technologies leads to innovation, where innovation performance mediates the relationship between technology orientation and financial performance (Lee et al. 2014; Lee at al. 2015). Market conditions (competitiveness) have a moderating role on the relation between TO and

firm growth (namely small and medium sized hotels in the related study) (Kasım and Altınay 2016). TO have a strong influence on technical acceptance and profitability (Jeong et al. 2006) and positively effects profitability at the average level of technology turbulence and a positive effect on business performance at high levels of technology turbulence (Gao et al 2007). TO leads to a better firm performance (Akman et al. 2008, Hakala and Kohtamaki 2010, Hyung and Dedahanov 2014). TO positively related to customer proximity and product uniformity directly, where those two leads to market performance and customer proximity leads to financial performance (Rajala and Westerlund 2012). The findings of Ibrahim and Shariff (2016) indicate the mediatory role of access to finance between TO and firm performance relationship. On the other hand, some studies reveal no direct relation between business performance and TO (i.e Zehir et al. 2010; Al-Ansari et al. 2015; Ho et al. 2016; Ibrahim and Shariff 2016; Aloulou 2018). Salovarji et al. (2015) indicates that TO rarely guarantees a market performance. Similarly, Kocak et al. (2017) imply that TO affects product innovation, but it does not directly affect the performance of firms.

Moreover, TO was associated with organizational learning (Zhou et al. 2005), learning orientation (Salavou 2005), organizational support and technology turbulence (Jeong et al. 2006), entrepreneurial orientation (Hyung and Dedahanov 2014), competitive intensity and demand uncertainty, adaptive capability (Zhou and Li 2010), market uncertainty, technological and market radicalness (Sainio et al. 2012), market performance and technological capability (Hsu et al 2014), and corporate entrepreneurship (Chen et al. 2014a).

There has been a gap in the current literature. TO has been discussed in strategic marketing management literature, but it was only associated with manufacturing or R&D departments of firms. That is the reason why TO is discussed at functional level. However, as a culture-based strategic orientation, this study proposes that TO is needed to be discussed at firm level. Moreover, in opposed to single dimensional construct as mentioned in literature, it is proposed to have a multidimensional construct for the first time.

Proposed Dimensions of Technology Orientation

TO mostly associate with a functional level strategy and specifically perceived with production. Roberts (1987) discussed that instead of focusing at functional level as in R&D and/or manufacturing, technology strategy should be discussed at corporate or business unit level (as in Berry and Taggart 1998). Technology component of a business strategy was discussed to include a firm's technological resources, types of R&D programs, R&D investments, internally developed or externally adopted technologies and organizational policies for development and use of technology (Zahra

and Covin 1993). Kantrow (1980) also implied that, a technology-based innovative success could only be a result of a good interrelated communication, top management support, an effective resource allocation and a fit between technology and market. Lindman (2000) ascertained that TO is more than organizing R&D operations through technological innovation or in other words to catch a "commercial opportunity". It is the strategic use of technology; what makes some firms more competitive/successful than others, which indicate that why some firms better at employing their abilities to take advantage of any new technological options (Morone 1989). Therefore, know-how, technical skills, the vision and mission of a firm, leader's perspective and perceptions, fast adaptation to new technology advancements, being flexible and being ready to give up what is in use and all such firm specific resources and capabilities are needed to be considered with TO. In other words, a cultural-based corporate/business level technology strategy, which is called TO, is most probably required more than a strong R&D and high technology background.

TO as a strategic orientation is a *culture-based, firm specific and consisting of complex capabilities* that fitting with RBV of the firm (Day 1994; Zhou et al. 2005). Built upon RBV of the firm (Wernerfelt 1984; Barney 1991), a corporate/business level culture-based strategic orientation that composed of hard to imitate, hard to substitute, rare and valuable capabilities may provide competitiveness and superior performance as expected from a strategic orientation. According to RBV of the firm, firms carried out heterogeneous characteristics that drive performance differences among them depending on their internal strengths that are resources and capabilities (Teece et al. 1997; Acar and Zehir 2010). Therefore, only when necessary resources and capabilities are deployed in a proper way, a firm may reach out the expected and differentiated performance outcomes (Sok and O'Cass 2011).

Capabilities are the organizational abilities to deploy the firm's current resources as well as to develop new capabilities (Henderson and Cockburn 1994). Capabilities are *"complex bundles of skills and collective learning, exercised through organizational processes that ensure superior coordination of functional activities*" (Day 1994). In his definition, Day (1994) especially highlighted the points such as collective learning, bundle of skills, coordination of functional activities and embedded routines in organizational processes. Capabilities make use of their assets and lead to develop more capabilities throughout the firm by the way of management tasks.

In sum, TO could be seen as a complex combination of capabilities that are glued with learning and unlearning to put together all the assets of a firm and enable to deploy them in an efficient and effective way. Taking one-step further from the current literature, this study proposed TO in a multidimensional construct. Those proposed dimensions are top management capability, technology capability, learning and unlearning.

Top Management Capability

A strategic orientation is expected to be in the context of the general corporate strategies as well reflecting the firm culture. Thus, a technology-oriented firm is needed to be in line with the mission and vision of the firm. Therefore, according to the strategic direction, top management should decide on whether to develop technology internally or acquired from the outside; in what extent to invest on R&D; to compete or to cooperate with the rivals; which alternative way is the best for the firm now and for future (Morone 1989). Moreover, assuring the firm's operations are executed with up-to-date technologies and deciding on R&D investment amounts and directions, considering possible future projections are also management's responsibility (Antoniou and Ansoff 2004).

One of top management roles is to identify and select all the key resources and then to transform them into capabilities. As a reflection of corporate leadership, management skills may be configured as management capabilities which composed of especially leadership, vision and planning (Celuch et al. 2002; Acar and Zehir 2009).

The main source of being competitive is tied to top managements' capability of combining other organizational capabilities and skills to adapt to fast changing environment rapidly (Prahalad and Hamel 1990). Moreover, technically trained managers and/or managers that interact with technical/technological operations extensively are more likely to integrate technology into strategic decision-making (Morone 1989). Managers make difference in how they see the environment, evaluate the alternatives, the decisions they made. In terms of new product development perspective, because no innovation can be created in a vacuum, top management support and resource commitment have utmost importance (Jeong et al. 2006). Prahalad and Hamel (1990) argued that one of the core capabilities of a firm is management's ability to consolidate companywide technologies, skills and other resources into competencies and capabilities to adapt quickly to changing opportunities.

Top management is responsible for strategic direction and shaping the operations of the firm (Antoniou and Ansoff 2004; Lau et al. 2008). Top management need to consider which strategic orientation fit best with the firm culture; what if there is a need to change or modify strategic orientation. Even constructing a TO is not enough. Management then needs to consider whether to be to pioneer or the follower in the market and/or to produce technology internally or to acquire from the outside according to the firm's overall strategy (Morone 1989). Therefore, management executes several strategic roles such as determining the strategic way of the firm; constructing and/or sustaining and/or transforming organizational culture; effective

resource allocation; combining appropriate resources and capabilities and direct them to organizational aims; making important decisions. In this regard, top management expected to be good at leadership, planning, communicating with all the stakeholders, scanning and interpreting external environment. They need to share the mission and vision of the firm and be competent on the core technical competencies of the firm. In line with several studies (e.g. Celuch et al. 2002; Acar and Zehir 2008, 2009, 2010), this study proposes that top management capability is one of the key sources of a firm competitiveness, in line with the research, one of the components of TO.

Technological Capability

Technology is proposed as a firm's most essential core capability (Itami and Numagami 1992). Technology resources are in the centre of competitive advantage because specific technology resource combinations provide hard to imitate and unique positions (Voudouris et al. 2012). Voudouris et al.'s (2012) study pronounces these "specific technology resource combinations" as technological capability.

Technological capability is *"a set of pieces of knowledge that includes both practical and theoretical know-how, methods, procedures, experience and physical devices and equipment."* This capability is closely associated with product, design, process and information technologies (Wang et al. 2006). Panda and Ramanathan (1996) defined technological capability as "*a set of functional abilities, reflected in the firm's performance through various technological activities and whose ultimate purpose is firm level value management by developing difficult-to-copy organizational abilities."*

Technological capability is defined as the knowledge and skills that are necessary tools for firms to choose, install, operate, maintain, adapt, improve and develop technologies. The strength of technological capability depends on how effective the components of the capability have been bundled. Therefore, the components, namely R&D commitments and expenditures, technical skills of personnel and how to improve these skills especially by trainings in order to increase technological capability endowments are seemed to strengthen this capability (Madanmohan et al. 2004).

Firms that aim to reach competitiveness by technology-based product innovation should have a strong technological capability (Li 2005; Hakala and Kohtamai 2010). A firm's technical skills, R&D resources and technological base are also seen to be the crucial factors that bring competitiveness through innovations (Jeong et al. 2006). Furthermore, they also considered to improve their technological capability continuously in order to offer new and advance products to market, hence to customers (Gao et al. 2007).

Several studies (e.g. Celuch et al. 2002; Tsai 2004; Song et al. 2005; Acar and Zehir 2009, 2010) handled technological capability like production capabilities where they include product/service processing, R&D resources, product quality and after sales services into the definition of the concept. This view especially overlaps with the perceptions, where TO is associated with new product development and production processes. Thus, considering the general tendency in the literature, most studies handle technological capability in functional level. In a similar vein, Song et al. (2008) emphasized that technological capability enables an organization to improve production processes while reducing costs. They highlighted that technological capability involves manufacturing processes, new product development, production facilities and forecasting of technological change in the corresponding industry.

A technology-oriented firm has an ability to match internal technological capability such as scientific expertise and/or internal communication with external technological opportunities like intelligence gathering and/or technological scanning that in the end likely to provide competitive advantage (Yang et al. 2012). At least firms that use technology strategically must have the capacity to develop or identify technology-based opportunities for dealing with the environment in a way to realize their strategic vision (Morone 1989). Therefore, in order to be stay competitive, technological capability is needed to be considered as one of the dimensions of TO.

Learning

The fields of strategic management and strategic marketing management consider organizational learning as one of the principle sources of competitive advantage and organizational performance (Jimenez-Jimenez and Sanz-Valle 2011). *Organizational learning is defined as a process of creation, acquisition and integration of knowledge aimed at the development of resources and capabilities that contribute to better organizational performance* (Lopez et al. 2005). Learning in organizational level is an organizational ability that provide insight and understanding from experience through experimentation, observation, analysis and a willingness to examine both successes and failures; then responding to that learning (Mohanty and Kar 2012). The ability to learn faster than the competitors is believed to bring competitive advantage (De Geus 1988:71 as cited in Lopez et al. 2005).

In contrast to physical resources/assets, capabilities do not deteriorate as they applied and shared; instead, they grow (Prahalad and Hamel 1990). Learning is the mechanism that makes resources turn into valuable, rare, inimitable and no substitutable capabilities by experiences and repetition. During this process, experience and converting every bit of information to the permanent corporate knowledge was highlighted (Acar and Zehir 2009). Organizational learning mostly discussed as a combination of four processes. These are knowledge acquisition through external and

internal sources, information distribution among members, information interpretation in order to achieve a common understanding and organizational memory which aims to store accumulated knowledge in order to use when necessary (Huber 1991; Lopez et al. 2005; Skerlavaj et al. 2007; Acar and Zehir 2009).

Because information needs to be converted into knowledge throughout the organizations, organizational learning needs to be considered in all strategic orientations including technology-orientation (Hortinha et al. 2011). In many studies (e.g. Chidamber and Kon 1993; Day 1998; Hortinha et al. 2011), technology-related/ strong R&D based innovations are considered ignoring customer expectations; rather there is misconnection between R&D personnel and market demand. In a technology-oriented firm, it is not necessarily the case. On the other hand, leading customers may also be risky. Thus, continuous learning and refining judgments would provide more expected outcomes (Day 1998). In a competitive environment gathering information from the inside of the organization along with outside of industry would probably provide a clear and broad perspective to where and how to employ technology-based infrastructure.

Learning related activities in an organization was characterized as diagnosing staff training needs, analysing a firm's ineffective operations and activities, communicating and sharing lessons learnt from past experiences throughout the organization and learning new and relevant knowledge (Sok and O'Cass 2011).

Technology-oriented firms also get feedbacks about the new products; failure or success of these newly introduced technologically superior products in the eyes of customers; what improvements they need to do in order to be successful next time, etc. From the perspective of searching technological opportunities for instance deciding to merge with another high-tech company, again a market research that consists of a learning activity consisted is needed. A technology-oriented firm may stay competitive not only introducing new technologies/technology-based products but also imitate a first-mover's introduced technology/product. Thus, learning component of TO may also bring one more advantage to a firm by the way of learning, specifically market research and/or competitor scanning.

Picking up a strategic orientation obviously will not lead to a higher performance; instead exceedingly implanted a value and belief system needs to be constructed throughout the organization (Zhou et al. 2005). They claimed that dissemination and acceptance of such a strong belief system could be a result of effective tool namely organizational learning. Therefore, in this study learning was proposed as one of the dimensions of TO.

Unlearning

As a fundamental process that facilitates new learning/knowledge creation/ innovation/technology production, unlearning (a) is concerned with removing/ discarding knowledge, (b) can have subjective value attached to it such as irrelevant, obsolete etc., and (c) can either be an end by itself or act to an end: learning or change (Srithika and Bhattacharyya 2009). Unlearning has three dimensions: cognitive- to receive new knowledge, behavioral – the changes in routines, and normative- removing all discarded routines from organizational memory (Yıldız and Fey 2010). Unlearning incorporates both cognitive and behavioural dimensions (Tsang and Zahra, 2008). It is a process that "*organisations changed their cognitive structure, mental model, dominant logic and core idea so as to realise the relocation of organisation value, norms and practices*" (Cegarra-Navarro et al. 2010). "As much as change is about adapting the new, it is about detaching from the old" (Burt 1890 as cited in Yıldız and Fey 2010). Therefore, in order to utilize unlearning, commitment to learning and commitment to change may seem to be required. However, it is not easy for people to ignore their current and well-established beliefs and practices in organizations. As Starbuck (1996) highlighted *"Because current beliefs and methods shape perceptions, they blind people to some potential interpretations of evidence. As long as current beliefs and methods seem to produce reasonable results, people do not discard their current beliefs and methods"*.

Unlearning is removing something intentionally which is well established in an organization's memory, routines and beliefs. This process is seemed to be a precondition for learning something new. Leaving behind accustomed practices/ strategies, previous methods/approaches, which are blocking the new ways of learning, is also considered as organizational competitiveness (Holan et al. 2004; Cegarra-Navarro and Moya 2005). However, collective memory can create inertia and can constraint future changes. For instance, with a poor track record/history of a new technology implementation reminding people the wasted efforts and time during the previous technology implementation, is linked to people's feelings/expectations. So, there will be resistance to unlearn (Becker 2010). To overcome such resistance, to invest in human factor, communicate with, and support employees involved in implementing and using the technology is important. It is managers' job to move quickly to break the established routines and provide a venue to create a more suitable re-established working environment in line with the new strategic requirements.

Producing or implementing any technologies and/or innovations requires organizational unlearning (Becker 2010; Cegarra-Navaro et al. 2010; Wang et al. 2013). Especially innovative firms expected to be good at unlearning (Holan et al. 2004). Through unlearning, organizations foster a capacity where employees continuously be able to increase their abilities to articulate knowledge and use

technology tools (Cegarra-Navaro et al. 2010). While producing new knowledge and technologies requires acquiring knowledge from the external environment, sharing knowledge and developing new knowledge within the organization, unchanged cultural beliefs will result in rigidity or inertia. Through eliminating existing cognitive structures, improving cognitive modes, abandoning old routines and practices, organisational unlearning can remove obstacles to acquiring new knowledge from the external environment, forming mechanisms to integrate old and new knowledge and accelerating the creativity of new knowledge, so innovation can be promoted throughout the organization (Wang et al 2013) as well as producing/implementing technology.

Therefore, in order to make a tandem combined change in beliefs and routines (Akgun and Lynn 2003) to introducing externally generated and/or internally developed new technologies in all functions throughout the organization, unlearning was proposed as a dimension of TO in the study.

Discussion

Recalling the definition of TO, in this study, the concept highlighted either externally generated or internally developed technologies and introducing these technologies in all functions throughout the organization. In order to be competitive and to make above average returns, an organization requires a wide range of capabilities (Song et al. 2008). However, prioritization and a right combination of capabilities which are parallel to strategic direction can provide sustainable competitive position.

Primary strategy determines the characteristics of distinctive capabilities that a firm needs to build, combine and develop in order to stay competitive (Weerawardena et al. 2006). Therefore, a combination of capabilities and skills were decided to consider as the dimensions of a TO. In this direction, top management capability, technological capability, learning and unlearning were proposed as the dimensions of such a culture-based primary strategy. These capabilities and skills are indeed interconnected with each other.

Any strategic orientation is shaped by top manager cognitions which may be listed as current operations and performance, perceived resource combinations and future projections of the industry, and actual organizational resources (Lau et al. 2008). In the context of corporate strategy and choice of orientation, management make decisions on which is best suited. This choice guides a firm accumulation and deployment of technological resources and capabilities (Zahra 1996). In their decisions making processes, managers are highly keen on relevant and a wide range of information. Management information system (MIS) provides a wide variety of information to equipped managers with the applications such as decision support systems, enterprise

resource planning (ERP), customer relationship management (CRM) (Demir and Gümüşoğlu 2009: 75-86). Technological capability is expressed as a knowledge-based capability, which is embodied in skills and build upon experiences, organizational systems and prior learning (Figueiredo 2008; Haeussler et al. 2012). Frohman (1982) ascertained that only investing on R&D merely contribute to competitive position of a firm by the way of technology exploitation. In addition to R&D investment, a top management who has required knowledge on job and technical background, good at selecting and supporting technology in the operations and reinforces systems and structures of the firm by vision most likely work out.

In contrast to some resources, capabilities cannot easily be transferred to other firms, bought or imitated. Firms mostly developed those capabilities through organizational routines that are commonly shared, and which involves the development, collection and exchange of information (Killen et al. 2008). Learning is considered as a catalyst. The firms which purposefully and consciously integrate learning in utilizing their traditional resources and capabilities, they can create more valuable outputs in comparison with their competitors (Süral-Özer et al. 2004). Paladino (2007) and Acar and Zehir (2009) argued that repetition and putting what is learned into the routine procedures make permanent organizational information which indeed turned resources into capabilities. However, besides utilizing learning throughout the organization, firms need to question their current routines, procedures and processes in order to cope with changing requirements (Sok and O'Cass 2011). Therefore, firms need to utilize unlearning processes, besides learning.

Conclusion

TO studies strongly keen on technology-push and product-oriented management approach. Technology-push approach assumes that technological superiority is favourable in the eyes of customers; therefore, those firms heavily invest on R&D activities as well direct their resources to improve their technical aspects. Firms that embrace product-oriented management focus on firm supplies rather than customer needs and wants. In this manner, current quantitative studies mostly handle TO as a driver of new product innovation. Therefore, although strategic orientations are discussed at firm level, TO is associated with functional level, namely production and/or R&D department strategies.

This study opposes this statement and proposes that TO is not only related with final outputs of product innovation processes but also is about using, advancing and/or transferring technologies that will be used in those processes. Those technology-based applications are more likely to lead a firm to increase its speed in production and provide cost advantages. In addition, beyond production processes, managerial

efficiencies are also expected to be improved via technological advances, which give accurate and timely information on decision-making. Moreover, TO is not only composed of "creating new technologies" but also noticing a promising or accepted technology and, imitating and/or adopting it into the firm processes and/or production functions in order to be competitive. Depending on these oppositions and vision, a new and multidimensional construct for TO could be discussed in the literature. This study aimed to propose a new and multidimensional construct of TO for future studies after portraying the current understanding and operationalization of the concept in the literature.

Technological capability, top management capability, learning and unlearning were proposed as dimensions of TO in this study. The gap of associating TO on functional level as a reflection of technology-push approach was argued in detail. Beyond pointing out the shortcoming regarding to associating TO with R&D investments and production processes, TO was proposed to be redefined and operationalized at firm level. It is intended that future studies could operationalize and test the proposed dimensions of TO. By this regard, strategy literature may achieve to a new understanding and operationalization of a new TO scale.

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