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SZERKESZTŐSÉG ÉS KIADÓHIVATAL:
1093 Budapest, Fővám tér 8.
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Primecz Henriett
vezetestudomany@uni-corvinus.hu

OLVASÓSZERKESZTŐ:
Nusser Tamás

SZERKESZTŐSÉGI TITKÁR:
Halász Ágnes
titkarsag.veztud@uni-corvinus.hu

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VEZETÉSTUDOMÁNY

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MANAGERIAL ANTECEDENT FACTORS OF EXPORT MARKET-ORIENTED ORGANIZATIONS AND THEIR PERFORMANCE CONSEQUENCES – STUDYING HUNGARIAN HIGHER EDUCATION INSTITUTIONS USING A CONFIGURATIONAL APPROACH

AZ EXPORTPIAC-ORIENTÁLT SZERVEZETEK VEZETŐI ELŐZMÉNYTÉNYEZŐI ÉS TELJESÍTMÉNYKÖVETKEZMÉNYEIK – A MAGYAR FELSŐOKTATÁSI INTÉZMÉNYEK VIZSGÁLATA KONFIGURÁCIÓS MEGKÖZELÍTÉSSEL

The study focuses on the managerial antecedents of export market-orientation and tests the complex interaction of these factors to two outcomes of interest (that is, high export market performance vs. the absence of high export market performance) with a fuzzy-set qualitative comparative analytical approach (fsQCA). Using a combined survey data of twenty five export-orientated higher education institutions based in Hungary the results show that a complex interaction of managerial antecedents factors to export market-orientation and export market-orientation leads to a high export market performance, whereas misfit between these factors yields the absence of a high export market performance; a complex analytical and theoretical approach missing from export market-orientation and strategic human resource management literatures. Results of the study can enrich the understanding of the complex interaction of the managerial antecedent factors to export market-orientation; therefore, providing valuable insights to academic and managerial audiences alike.

Keywords: export management factors, export reward and training systems, export market-orientation, export market performance, fuzzy-set methods, higher education institutions

A tanulmány az exportpiaci orientáció vezetői előzményeire fókuszál, és e tényezők komplex kölcsönhatását teszteli két érdekes eredménnyel (vagyis a magas exportpiaci teljesítmény vs. a magas exportpiaci teljesítmény hiányával) egy fuzzy-set minőségi összehasonlító analitikus megközelítéssel (fsQCA). Huszonöt magyarországi székhelyű exportorientált felsőoktatási intézmény összesített felmérésének adatai alapján az eredmények azt mutatják, hogy az exportpiaci orientáció és az exportpiaci orientáció vezetői előzménytényezőinek komplex kölcsönhatása magas exportpiaci teljesítményt eredményez, míg az ezek közötti eltérések, tényezői a magas exportpiaci teljesítmény hiányát eredményezik; egy complex elemző és elméleti megközelítés hiányzik az exportpiac-orientált és stratégiai humánerőforrás-menedzsment szakirodalomból. A vizsgálat eredményei gazdagíthatják a vezetői előreljelző tényezők complex kölcsönhatásának az exportpiaci orientációval kapcsolatos megértését; értékes betekintést nyújtva a tudományos és vezetői közönség számára egyaránt.

Kulcsszavak: exportmenedzsment-tényezők, export jutalmazási és képzési rendszerek, exportpiac-orientáció, exportpiaci teljesítmény, fuzzy-set eljárások, felsőoktatási intézmények

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Authors/Szerzők:

Dr. József Berács¹ (josef.beracs@uni-corvinus.hu) professor; Gábor Nagy² (gnagy@insec.com) assistant professor

¹Corvinus University of Budapest (Budapesti Corvinus Egyetem) Hungary (Magyarország); ²INSEEC Grande Ecole Paris (INSEEC Grande Ecole Paris) France (Franciaország)

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Export market-orientation (henceforth EMO) plays a key role in the international marketing literature. The mechanism through which EMO translates into superior performance have been investigated by numerous studies (see Kirca, Jayachandran, & Bearden, 2005; Katsikea, Theodosiou, Perdakis, & Kehagias, 2008). However, previous research shows that organizational acceptance of EMO can be quite cumbersome. Potential obstacles to EMO adoption relate to sociocultural (Lichtenthal, 1992), management related (Jaworski & Kohli, 1993), process (Harris, 2000; Pulendran & Speed, 1996), and budgeting and training obstacles (Harris, 2000; Morgan & Piercy, 1991). Despite earlier research efforts, knowledge about the complex interaction of antecedent factors and, therefore, the adoption of EMO remains scarce (see e.g., Cadogan, Paul, Salminen, Puumalainen, & Sundqvist, 2001; Kirca et al., 2005; Mostafiz, Sambasivan, & Goh, 2021; Vuorio, Torkkeli, & Sainio, 2020). Apart from Ordanini and Maglio's study (2009), researcher on the antecedents of EMO have almost completely omitted the question of internal fit among managerial antecedent factors and its performance consequences (see Kayabasi & Mtetwa, 2016; Nagy & Berács, 2013; Navarro, Acedo, Robson, Ruzo, & Losada, 2010). The market-orientation literature has relatively few studies which are related to the higher education (see Hemsley-Brown & Oplatka, 2010, Nagy & Berács, 2013). The reason for it is the lack of intensive use of market mechanisms and the controversial judgement of marketisation in higher education. The internationalization of higher education gave a new impetus to developing export marketing activities and EMO as well (James & Derrick, 2021; Németh & Vida, 2021).

An important subject for (strategic) human resources management research is the concept of congruence, or fit, between different sets of organizational policies and practices (Hambrick, 1983; Hrebiniak, 1981; Ketchen et al., 1997; Meyer, Tsui, & Hinings, 1993; Woodside, 2018). Organizational configurations suggest that organizations consist of interconnected structures and practices – not modular and loosely coupled entities whose components can be investigated in isolation – and that fit between these elements that is “whole and complete” leads to high firm performance (Hambrick, 1983; Hrebiniak, 1981; Ketchen et al., 1997). To investigate these complex organizational configurations a fuzzy-set qualitative comparative analysis (fsQCA) (Fiss, 2007; Frösen et al., 2016) is employed. Configurational methods imply that for sets of causal factors there exist combinations of elements that are expected to contribute to organizational effectiveness maximization (Ketchen et al., 1997; Meyer et al., 1993). The study tests the complex interaction of export management factors, export reward and training systems, export organizational demographics, and EMO to two outcomes of interest (that is, high export market performance vs. the absence of high export market performance) using a set-theoretic approach. The results show that fit between these factors leads to high market performance (henceforth EMP), whereas misfit between these elements eventuates in the absence of high EMP.

Theoretical development and research questions

Antecedents of EMO

Top management's emphasis on export market orientation. Top managers can exhibit a wide range of behaviours, and appraisal and compensation to affect individual behaviour are central tenets of (employee) reinforcement, behaviour modification, and motivation (Schuler & Jackson, 1987). Managerial competences include (1) the unique capabilities to articulate a strategic vision, communicate the vision throughout the organization, and empower organizational members to realize that vision (Westley & Mintzberg, 1989) and (2) establish the equilibrium (balance) between the organization and the environment (Hambrick & Mason, 1984; Tushman & Romanelli, 1985). These managerial capabilities determine the acquisition, development, and deployment of organizational resources, how resources are converted into competitive product/ service offerings and delivered to organizational stakeholders that are potent sources of competitive advantage (Lado et al., 1992).

Management's commitment to exporting. Management's commitment to exporting (being a strategic factor) entails a specific resource allocation to the organization's foreign trade operations, and towards continuous improvement of the organization's products/services in foreign markets (Lages et al., 2008). Commitment to exporting can condition managers' willingness to achieve the organizations' marketing objectives on international markets, and management evolution and reward systems condition employees' motivation and learning towards specific organizational goal attainment (O'Cass & Julian, 2003).

Export market-oriented training systems. Training systems are the mechanisms by which organizational (labor) information is circulated, workers are recruited, and skills are obtained (and shared) (Bailey & Waldinger, 1991). Furthermore, training systems “are structures that reduce the risk of investment in skills or training by increasing the probability that firms and/ or workers will be able to make productive use of the skills in which they have invested” (Bailey & Waldinger, 1991, p. 433). Training of (frontline) employees—both in job-related and behavioral related skills—to improve their capability to deal with varying customer needs is of crucial importance in delivering superior (service) quality (Bettencourt & Gwinner, 1996; Hart, Heskett, & Sasser, 1990). Employees not possessing the requisite job and interpersonal skills fail in providing satisfactory services leading to mediocre organizational performance (Boshoff & Allen, 2000).

Export market-oriented reward systems. An organization's reward structure has a significant impact on organizational goal attainment. If organizational members are rewarded to follow certain goals, they will be motivated to work in this direction. Bagozzi's attitude theory asserts that appraisal leads to emotional response that in turn causes certain behaviour (i.e., appraisal → emotional response → behaviour) (Bagozzi, 1992). Perception of

training and rewards, in turn, will influence employees' job satisfaction and attachment to the organization resulting in higher level of EMO and subsequently higher EMP. These conceptual relationships were proved empirically with significant positive correlation coefficients between market-orientation and top management emphasis ($r = 0.44$), managerial commitment ($r = 0.71$), market-based reward system ($r = 0.41$), market-oriented training ($r = 0.54$) in different industries (Kirca et al., 2005).

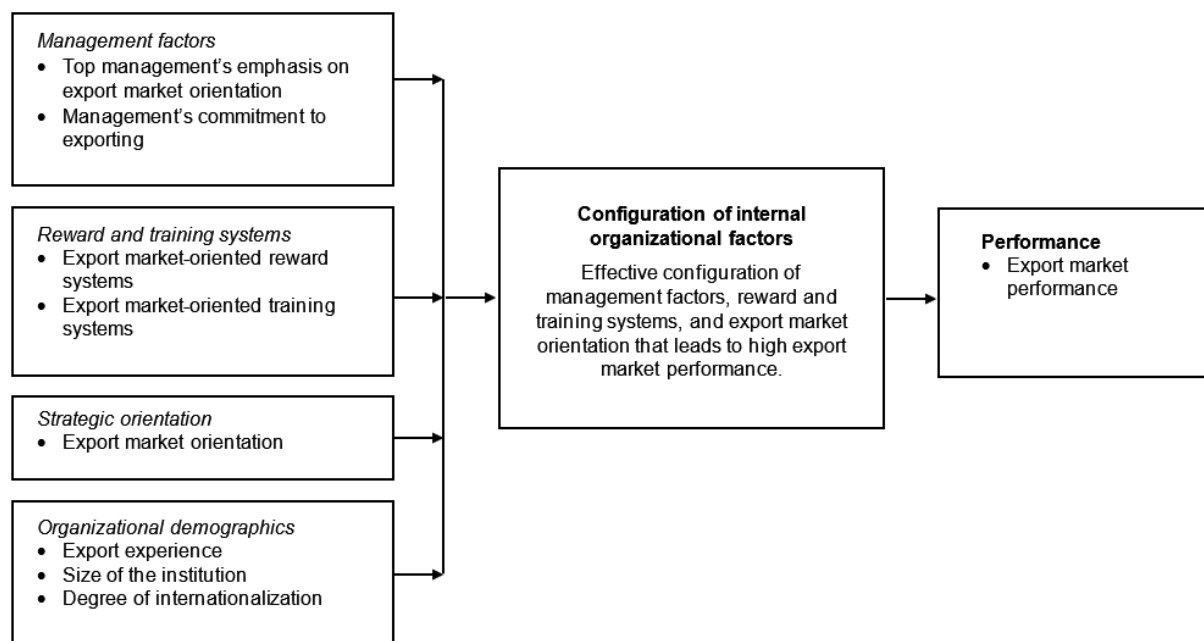
Export market-orientation. A market-orientation is a set of activities associated with the gathering and dissemination of market intelligence, the analysis, and the response to that intelligence (Kohli & Jaworski, 1990). After a one and half decade research Cano et al. (2004) and Kirca et al. (2005) concluded that market-orientation influences business performance in many industries and continents. Hemsley-Brown and Oplatka (2010), Nagy and Berács (2013) and Sukoco et al. (2021) proved the same relationship for the higher education institutions in different national settings. Recently, James and Derrick (2021) compared three higher education institutions from Canada, UK and Hong Kong and showed that differences in export marketing orientations are shaped by national policy frameworks and organisational culture. Export market-orientation (EMO) is defined as an organizational

Organizational demographics. The study uses three organizational demographic variables: export experience (see Cadogan et al., 2009), size of the university, and proportion of international students. Export experience denotes an ability to identify information and sales opportunities from foreign markets (Cadogan et al., 2009). Size of a higher education institute marks the number of full-time students. In addition, proportion of international students is a proxy for the degree of internationalization (see O'Cass & Julian, 2003).

Quality assurance and market orientation. The Total Quality Management (TQM) concept is very close to the customer orientation as the key component of EMO. The quality as a scientific construct, is extensively used in practice and broadly discussed in the literature of higher education (Prakash, 2018; Lakal et al., 2020; Tóth & Surman, 2021). From marketing perspectives, the Service Quality literature uses the SERVQUAL for performance measurement (Gregory, 2019; Tóth & Surman, 2021) focusing on students (Kéri, 2021). Most of the higher education institutions in Europe are hiring quality assurance agencies which are accredited by ENQA. The ENQA – European Association for Quality Assurance in Higher Education – published the ESG (European Standards and Guidelines) first in 2005 and later in (Figure 1).

Figure 1

Conceptual framework of the study



Source: own compilation

culture that helps a firm to (1) generate market intelligence pertinent to a firm's export operations, (2) disseminate this information to different functional units in the organization, and (3) design and implement strategic responses related to export customers, competitors, and other relevant market actors that can help a firm to create superior value for export customers (Cadogan et al. 2001).

A set-theoretic approach to study complex interactions of export management factors, export reward and training systems, EMO, and organizational demographics

The strategic context influences individual human resource practices (e.g., employee selection, job design, and appraisal and compensation) (Hambrick, 1983; Keefe & Katz, 1990;

Kerr, 1985). Despite this, scholars know very little about how separate human resource management practices combine to produce “internal fit” (Baird & Meshoulam, 1988), and how antecedents of export performance combine to eventuate in superior performance (Ordanini & Maglio, 2009). Building on the tenet of internal fit in strategic human management and the literature on antecedents of EMO, we test the complex interaction of export management factors, export reward and training systems, organizational demographics, and EMO to two outcomes of interest (high EMP vs. the absence of EMP) with a set-theoretic approach based on fuzzy-set QCA. The study outlines the following research questions.

RQ1. What configuration of export management factors, export reward and training systems, and EMO leads to high EMP?

RQ2. What configuration export of management factors, export reward and training systems, and EMO leads to the absence of EMP?

Methods

Research context

We collected primary data from the Hungarian higher education sector. This sector has undergone major changes during the period between 2010 and 2012. The government pulled out significant amount of resources from this sector (33 percent between 2008 and 2014)) and at the same time forced universities to increase the quality level of their services and become more competitive internationally. A tender for the titles of “University of Excellence” and “Research University” was launched signalling to the universities that, unlike previous years, resource allocation (financial support) to the institutions would be directly bound to performance appraisal (e.g., number of publications in internationally ranked journals, number of incoming international students, partnership and research collaboration with international universities, scoring high in international rankings, seeking external

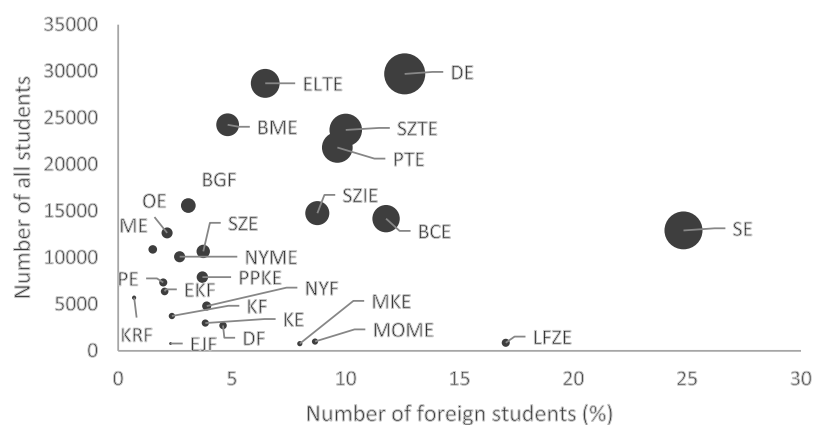
research funding etc.) (Berács et al., 2015). The Hungarian government had a new strategy (a ten-year plan) for internationalization of higher education in 2014. The number of foreign students should increase from 23 000 (2013) to 40 000 as the target value for 2023. This is almost achieved in 2019, with 38 422 foreign students thanks to the Stipendium Hungaricum, a government financed scholarship program.

Study population and data collection method

The population for the study comprised of all the state-owned and two non-state-owned higher education institutions (i.e., thirty-one entities). Mailing addresses, e-mails and telephone numbers of top management, middle management, and management of international offices of the state-owned and the two non-state owned Hungarian higher education institutions (altogether 31) have been collected from the universities’ websites. The contact list contained 700 potential respondents covering every potential member in the population. The list was cross-checked with data available from the website of the Department of Education of Hungary. A total of 700 questionnaires were sent out to rectors, deputy rectors, deans, deputy deans and managers of international offices. A ten-page questionnaire was designed using a back-translation process. The preliminary version of the questionnaire was pilot tested to determine the face validity, clarity, and the relevance of measurement items. Following the guidelines of respondents performing the pre-testing some items were revised to reduce potential ambiguity. The on-line survey lasted from 15th January 2012 to 2nd February 2012. Data collection was administered by a professional research agency. The sort of computer-aided survey employed allowed for continuous contact with respondents, for monitoring the stages of completion, for respondents to be segmented by behaviour, and for delivering targeted messages to them. The on-line survey yielded 70 questionnaires. After the on-line query, a mail-based phase was initiated resulting in another 86 respondents. Finally, 156 completed questionnaires were collected eventuating in 22 percent total response

Figure 2

The Number of Foreign Students (Bubble) According to The Proportion of Foreign Students (X axis) and to The Number of All Students (Y axis) in 2013



Note: Main characteristics of the universities included in the study (as of 2013)

Source: The Figure was prepared by Ágnes Somosi

rate. After data cleaning 130 usable questionnaires were available. Managers of 25 different universities responded to the questionnaire. On average, 5.2 (130/ 25) respondents per university answered the questionnaire, enhancing the validity of results.

Figure 2 illustrates the number of foreign students of 25 universities (reflected in the size of bubble) depending on the proportion of foreign students (X-axis) and the number of all students (Y-axis). It shows that the largest universities have the highest number of foreign students. The top eight universities are led by University of Debrecen (DE), followed by Semmelweis University (SE), University of Szeged (SZTE) and University of Pécs (PTE). (The exact numbers and the full names of the universities are shown in Appendix 3.) All of them have faculties of medical sciences, where the proportion of foreign students are around 50%. The next four universities are led by Eötvös Lóránd University (ELTE) and followed by three universities from the Capital city of Hungary.

Methods

Potential non-response bias was assessed through comparing responding and non-responding universities on export related management factors, export market-oriented reward and training systems, EMO, EMP, and organizational demographics. The results showed no significant difference between responding and non-responding universities (t -values ranged from 1.35 to 1.03), which suggests the non-response bias was not observed with our data. A Harman one-factor test was conducted to assess the problem of common method bias (Podsakoff & Organ, 1996). A factor analysis of all constructs resulted in a solution with 5 factors, which accounted for 75.41 percent of total variance, and the first factor accounted for only 32.02 percent of total variance. Furthermore, the confirmatory factor analysis (CFA) approach was employed, in which all the items were modelled as the indicators for a single factor representing method effects (Mossholder et al., 1998). The CFA model produced unsatisfactory model fit ($\chi^2(496) = 2238.15$, $p < 0.00$; GFI = 0.45; TLI = 0.34; CFI = 0.38; RMSEA = 0.16). Therefore, common method bias was not a serious problem for our data.

Measurement instruments

Except for management's commitment to exporting and top management's emphasis on EMO, all items were measured using a 7-point Likert scale (the former two constructs assessed with a 9-point Likert metric) (see Appendix 1). Management's commitment to exporting was assessed with Gencturk et al.'s (1995) scale. *Management's commitment to exporting* denotes a purposeful allocation of organizational resources to the organization's foreign trade operations that supports continuous improvement of the organization's export products and services (Lages et al., 2008). *Top management's emphasis on export market-orientation* was measured with Jaworski and Kohli's (1993) measurement instrument. Top management's emphasis on EMO is defined as a signal (from managers) about the importance of being responsive to export customer

needs and the broader export environment (Cadogan et al., 2001). *Export market-oriented reward systems* and *export market-oriented training systems* were assessed with Jaworski and Kohli's (1993) metric. Export market-oriented reward systems are designed based on export market performance criteria and motivate employees to enhance export market behaviour and related actions. Export market-oriented training systems sensitize employees towards export customer needs, stimulate actions and processes that are in line with value creation for foreign customers (Cadogan et al., 2006; Ruekert, 1992). The measurement instrument for EMO was adapted from Cadogan et al. (2009). The outcome variable (EMP) was developed based on previous studies on EMO and includes two items (Cadogan et al., 2001; Kwon & Hu, 2000). In addition, three *organizational demographic variables* were used: export experience (assessed with Cadogan et al.'s (2009) scale), size of the university, and proportion of international students. Measurement instruments are shown in Appendix 1.

Analysis and results

Reliability and validity analysis

Construct measures were refined and their reliability and validity were assessed using confirmatory factor analysis (CFA) (Hair et al., 2006). CFA was estimated including management factors, reward and training systems, EMO, organizational systems, and EMP. The purified model's fit indices suggest good fit to the data ($\chi^2(440) = 525.38$, $p < 0.00$; GFI = 0.79; TLI = 0.91; CFI = 0.91; RMSEA = 0.07). Individual items load on their respective latent factors with significant factor loadings ($p < 0.001$), and there is no evidence of cross loading. Thus, supporting unidimensionality and convergent validity of the constructs. The composite reliability of each construct ranges from 0.77 to 0.93, above the recommended threshold value of 0.70 (Bagozzi & Yi, 1988). *Discriminant validity* of the scales were assessed in two steps. First, the square root of average variance extracted (AVE) for each of the constructs was compared to between-construct correlations (i.e., shared variance). Discriminant validity was supported as the square root of variance extracted for two constructs was greater than the bivariate correlation of the two constructs (Fornell & Larcker, 1981). Second, each possible pair of constructs was combined into a single construct (more constrained model) and compared its fit with that of the model with more constructs (unconstrained model) (Hair, Heskett, & Sasser, 2006). In each case, the chi-square difference tests for the more constrained model provides better fit, showing an adequate level of discriminant validity. Overall, the results suggest that the measurement model fits the data well and the constructs exhibit decent psychometric properties supporting further analyses. Descriptive statistics are shown in Appendix 2.

Fuzzy-set calibration

For proposition testing, the current study employs a set-theoretic approach based on fuzzy-set QCA that

allows for a detailed analysis of how causal conditions contribute to an outcome of interest using Boolean algebra and algorithms. For a conceptual introduction to fuzzy systems see Kóczy and Tikk (2000) in the Hungarian literature. Outcome condition and antecedent conditions were calibrated regarding three substantively meaningful thresholds: full membership, full non-membership, and the cross-over point following Ragin (2008) and Ordanini and Maglio (2009). Set memberships and calibration measures are depicted in Appendix 2.

Fuzzy-set analysis results

Configurations for high export market performance

Table 1 presents the configurations of management antecedent factors and organizational contingencies sufficient to achieve high EMP (/ the absence of EMP). A total of five equifinal configurations leading to high export market performance were found by the fsQCA algorithm (with overall solution consistency ≥ 0.94 , overall solution coverage = 0.53, frequency cut-off = 1, and consistency cut-off = 0.95). Configurations leading to the absence of high EMP (i.e., not-high export market performance) form a solution set with four equifinal recipes (with overall solution consistency ≥ 0.79 , overall solution coverage = 0.50, frequency cut-off = 1, and consistency cut-off = 0.80).

Solution tables mark high on a condition with black circles (“●”) and low on a condition with the tilde sign (“~”), while “⊗” denotes absence of a condition (Ragin, 2008).

In *configuration C1* high top management’s emphasis on EMO couples with high management’s commitment to exporting, EMO training systems, EMO, export experience, large size and a high degree of internationalization achieving high EMP. Here, top management need to commit to export activities and emphasize the importance of a market-oriented culture inside the organization (Cadogan et al., 2006). An effective dissemination of values related to this culture requires an EMO training system that in turn increases the organization’s sensitivity towards international higher education markets (Mucsi, Malota & Török, 2020; Boshoff & Allen, 2000; Bettencourt & Gwinner, 1996; Hart et al., 1990).

However, it must be noted that management’s emphasis on and commitment to exporting translates into training systems and proper organizational behaviour only when the organization has had sufficient experience with export markets, is large in size, and shows a relatively high degree of internationalization, which aligns well with the knowledge based in international marketing literature (Cadogan et al., 2009; Cadogan et al., 2001; Berács, 2006; Navarro et al., 2010).

Table 1

Management Factors and Reward and Training Systems Sufficient for High vs. Not-High Export Performance: Results of the Configurational Analysis

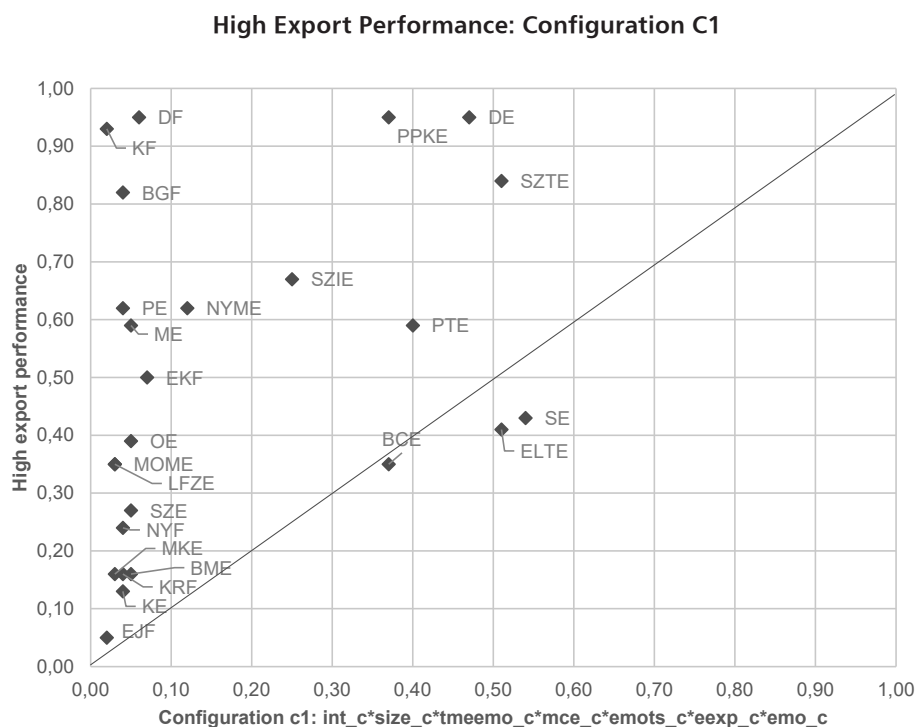
	High export market performance configurations ^{1), 2)}					Not-high export market performance configurations ^{1), 3)}			
	C1	C2	C3	C4	C5	C1	C2	C3	C4
<i>Management factors</i>									
Top management’s emphasis on export market-orientation (tmeemo_c)	●	●	●	~	●	~	●	~	~
Management’s commitment to exporting (mce_c)	●	●	●	~	~	~	●	●	●
<i>Reward and training systems</i>									
Export market-oriented reward systems (emors_c)	⊗	●	●	~	●	⊗	~	~	●
Export market-oriented training systems (emots_c)	●	⊗	●	●	●	~	~	●	●
Export market-orientation (EMO) (emo_c)	●	●	●	~	●	~	~	●	●
<i>Organizational demographics</i>									
Export experience (eexp_c)	●	●	●	~	●	~	~	~	~
Large size (size_c)	●	●	⊗	●	~	●	~	~	~
Degree of internationalization (int_c)	●	●	●	~	~	~	~	●	~
<i>Goodness of fit</i>									
Raw coverage	0.31	0.30	0.36	0.22	0.17	0.30	0.23	0.12	0.18
Unique coverage	0.02	0.00	0.04	0.05	0.03	0.17	0.07	0.04	0.04
Consistency	0.94	0.97	0.96	1.00	0.95	0.98	0.95	0.96	0.97
Solution coverage	0.53					0.50			
Solution consistency	0.94					0.79			

Notes: ¹⁾ “●” means high on a condition, “~” equals low on a condition, and “⊗” denotes “do not care” (i.e., either high or low).

²⁾ Consistency cut-off = 0.95; consistency cut-off = 1

³⁾ Consistency cut-off = 0.80; consistency cut-off = 1

Source: own compilation



Note: consistency = 0.94, coverage = 0.31

Source: own compilation

We illustrate the first column (configuration C1) in Figure 3 showing the positions of individual higher education institutions. The configuration C1 resembles us to the Figure 2. The top 7 universities regarding the number of foreign students are found here, and only the Budapest University of Technology and Economics (BME) is missing, which is substituted by Pázmány Péter Catholic University (PPKE). The managerial factors' configuration is similar, but still there are many differences of these universities as well. The flagship university of this configuration is University of Debrecen (DE). The DE *recruits* students *on its own*, which has proved to be an efficient marketing strategy (Berács, 2006). The medical faculties of DE developed an advanced *foreign representative and agent system* worldwide (in more than 70 countries), which is used now for other faculties too. DE was the only Hungarian University in 2020 ranked in TOP 200 according to the Ranking in Emerging Economies. The Covid-19 did not stop the internationalization of the university. In the 2020/21 academic year there are 6,297 foreign students, that is 20.9 percent of total 30,194 students.

Configuration C2 is very similar to C1. Here, high top management's emphasis on EMO associates with high management's commitment to exporting, EMO reward systems, EMO, export experience, and large size and degree of internationalization achieving high EMP. The only difference is in the substitution effect of rewards and training systems in achieving high EMP (Table 1). The C1 and C2 configurations show that EMO-related reward systems can be as effective as EMO-related training systems in shaping organizational members sensitivity towards export market operations. Without showing the

X-Y plots of configuration C2 we can conclude that most of the universities positioned in Figure 4 are represented in C2 as well. Semmelweis University (SE) as another flagship institute of excellent, elite universities, even though the leadership of Semmelweis University is relatively less satisfied with their export performance. With more than 3,800 international students from 60 countries in 2020, SE has the highest proportion (34.5 percent) of foreign students of large, Hungarian universities.

In configuration C3 management factors, reward and training systems, EMO, and export experience and degree of internationalization take a high value (size does not matter; can take either a high or a low value) and achieve high EMP. This shows that in addition to having either effective EMO reward systems or strong EMO training systems a successful organization can have them both to achieve high export market performance. The Pázmány Péter Catholic University represents mainly the managerial contingencies of this configuration, although most of the top seven universities could be found in the X-Y Plot.

Configuration C4 is the fourth success recipe in the solution set for high performing organizations. Here, only a few components take a high value – namely, EMO training systems and large size – to yield high EMP (the remaining elements take a low value). Hence, organizations do not even need to be export market-oriented (or having complex organizational systems in place that support the creation of this culture). The Western Hungarian University (NyME) is the flagship institute of this configuration.

In configuration C5 top management's emphasis on EMO couples with low management's commitment to exporting, high EMO reward systems, EMO training

systems, EMO, export experience and low size and degree of internationalization achieving high EMP. Organizations with small size have relatively simply organizational structure (Meijaard, Brand, & Mosselman, 2005), their information processing routes are more effective (Huggins & Johnston, 2010), and adapt faster to changing environmental contingencies (Schindehutte & Morris, 2001). This may explain why the importance of being export market-oriented may translate relatively easily into organizational processes, activities, and reward and training systems if the organizational members are able/ willing to comply with these values. The flagship institute of this configuration is the Eszterházy Károly College (EKF). Their efforts in internationalization had their merits because the government positioned their status to the “University of Applied Sciences” in 2016. This change probably could not happen, without “top management emphasis on EMO”, “export market-oriented reward system”, “EMO” and “export experience”, the other four conditions of C5 configuration. The higher education law of Hungary specified the criteria how the previous “Colleges” could be qualified to be “University of Applied Sciences” Among these criteria the internationalization, offering English language programs and courses played an important role (Berács, 2014).

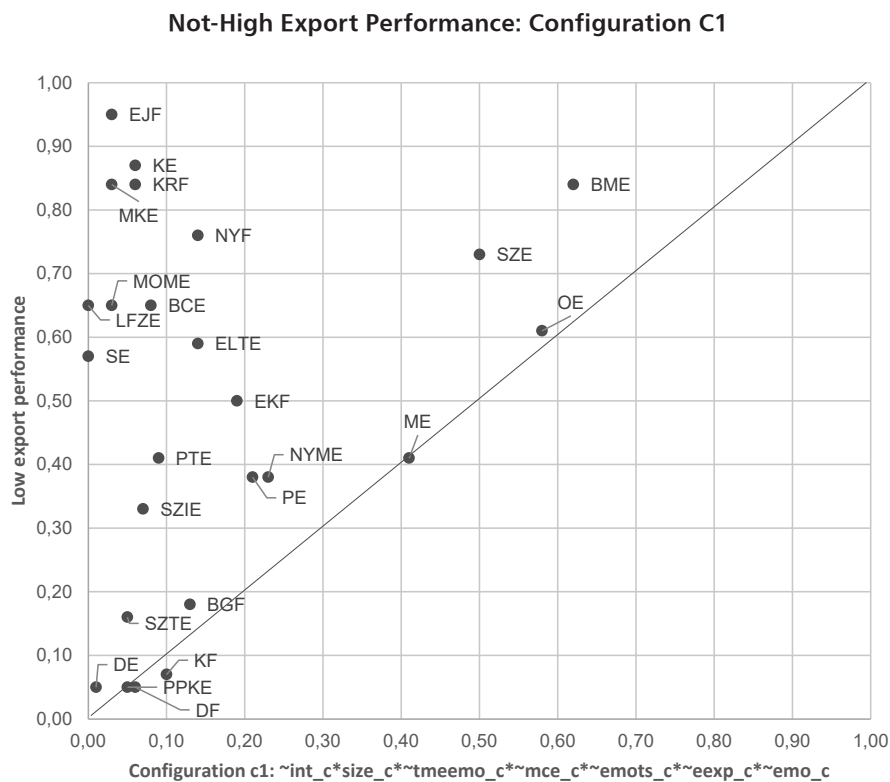
Configurations for the absence of high EMP

In configuration C1 low top management’s emphasis on EMO couples with low management’s commitment to exporting, EMO training systems, EMO,

export experience, large size, and low degree of internationalization leading to not-high EMP. Hence, if large size – and the administrative constraints related to such organizational structure – couples with lack of commitment to and emphasis on export-market related activities and no training and reward is provided to organizational members to pursue export-market related goals, the organization may achieve low EMP. (Here, lack of expert experience and low level of internationalization play crucial roles, as well).

The X-Y Plot of configuration C1, (Figure 4) represents the four technical universities of Hungary. This group creates a special cluster of low performing institutions with relatively high size, but all the other seven conditions are missing. The Budapest Technical University (BME) is the leading institute with Óbuda University (OE) of this group followed by Széchenyi István University (SZE) from Győr and University of Miskolc (ME). The two universities from Budapest are less satisfied with their performance. The dissatisfaction at BME resulted in higher activities of internationalization. The export income from foreign students achieved 1.5 billion forints (close to 50 million Euros) in 2016, which is three times higher than it was 5 years before. This result is the consequence of the following detailed objectives of internationalization specified before: (a) increasing the number of accredited English language programs by 5 percent; (b) increasing the number of available English language courses by 25 percent; (c) increasing the number of foreign students by 100 percent in 5 years.

Figure 4



Note: consistency = 0.98, coverage = 0.30

Source: own compilation

Configuration C2 shows a solution where in high top management's emphasis on EMO and management's commitment to exporting couple with low values on the reimagining conditions in the fuzzy-set model. This indicates that commitment to and emphasis on export market related activities are not sufficient to achieve high EMP if the organization does not have EMO-related resources and capabilities and if the latter are not deployed effectively (cf. configurations C1, C2, C3, and C5 for high EMP). The flagship institute of this group is a small private college, the Eötvös József College (EJF) alone. The top managers have visions, but the export capability is missing to fulfil the expectations.

Configuration C3 (not-high export performers) pinpoints a recipe in which low top management's emphasis on exporting couples with low reward systems, lack of experience and low size (on other conditions organizations take a high value) achieving not-high EMP. This may imply that if top management does not emphasize EMO and organizational members are not rewarded to strengthen the organization's international presence, it is challenging to gain international experience which may result in deteriorating EMP (even if other components of the recipe take a high value).

In configuration C4 low emphasis on EMO coupled with lack of export experience, low size, and low degree of internationalization – when other components take a high value – can be sufficient to achieve not-high EMP. Similarly to configuration C3, lack of top management emphasis coupled with low levels on organizational demographics can lead to low EMP. The last two non-high export performance configurations (C3 and C4) are represented only by two art universities in the X-Y Plot graphics: the Liszt Ferenc Music Academy (LFZE) and the Hungarian University of Fine Arts (MKE). It seems to be a contradiction, because these art universities are well-known worldwide and have good international reputation. But why did it happen, that their colleagues declared themselves lower level at export performance. The answer is in the scales, what we used for judging the export performance. It asked: "To what extent are you satisfied with the pace of entering new markets for student recruitment?" These top art schools have high expectations, while their satisfaction level is just the opposite.

This situation is just the reverse/opposite version of what we experienced in case of top performing universities (configuration C1, Figure 3), where the Kecskemét College (KF) and the Dunaújváros College (DF) seem to be outsiders in the group. They have high satisfaction with their performance, but their expectations are low. It is reflected in the low proportion of foreign students, KF (2.36%) and DF (4.61%), while the average is 6.44%. These are examples of situations, where there are differences of feeling the importance of marketing orientation and implementing them.

Theoretical contributions and conclusions

EMO takes a pivotal role in the international marketing literature. Much focus was placed on investigating its

performance consequences and the mechanisms through which EMO translates into superior business performance (Katsikea et al., 2011; Kirca et al., 2005; Lages, Jap, & Griffith, 2008). However, only scarce efforts have been taken to investigate what factors lead to the emergence/retreat of EMO. Barriers to acceptance of market-orientation and EMO are manifold and earlier research has done much to improve the knowledge base on this front (Cadogan et al., 2001; Harris, 2000; Jaworski & Kohli 1993; Kirca et al., 2005; Lichtenthal & Wilson, 1992; Mostafiz et al., 2021; Ordanini & Maglio, 2009; Pulendran & Speed, 1996; Vuorio et al., 2020). Although much has been done on this front, we still lack understanding of the complex interactions of the antecedent factors of EMO and their performance effects (Ordanini & Maglio, 2009). To understand causally complex relationships between the antecedents of EMO and their performance outcomes, conventional symmetric analytical methods (that is, "either/or" binary choices) should be complemented with configurational analysis as the former techniques paint an incomplete picture of how EMO organizations navigate complex environments to achieve high performance (or avoid failure) (Du & Kim, 2021; Woodside, 2018). Building upon the above stream of research this study investigates the complex interaction of export management factors, export reward and training systems (i.e., antecedents of EMO), and EMO to two outcomes of interest (i.e., high EMP vs. the absence of high EMP), therefore, contributing to EMO and strategic human resource management literatures.

Managerial implications

Results of the analysis may provide useful insights for practicing managers, as well. First, managers have the status and power to influence organizational actions. If managers are committed to exporting, they allocate resources to the organization's foreign trade operations, and encourage employees to continuously improve the organization's products/services in foreign markets. Furthermore, top managers can induce a wide range of behaviours, and through appraisal and compensation they can influence employee behaviour. Export training systems can translate top management's values, norms, and goals about EMO into EMP, and export reward systems can steer employees' behaviour towards the fulfilment of export marketing objectives (i.e., high performance). Overall, fsQCA results show that fit between export management factors, export reward and training systems, EMO and export organizational demographics can help an organization to achieve high EMP, whereas misfit between these elements eventuates in the absence of high EMP. Most of the public Hungarian higher education institutions change their model of operations and instead of the government, the boards of foundations are responsible for the marketization and internationalization. The constructs of our export performance model might play a great role in their activities. It complements the quality approaches in higher education literature (Prakash, 2018) and the expectations of the European Association for Quality Assurance (ESG).

Future research

There appear to be several areas in need of future research. *First*, following our analysis results, commitment to allocate resources to the organization's foreign trade operations and the notion of continuous improvement of the organization's export products/ services translate into export reward and training systems and ultimately, high export performance. Other potential intervening factors may strengthen (/ hinder) these relationships: such as, uncertainty and risks related to exporting, or the mode, direction, and speed with which the organization advances along the export development path (see Leonidas et al., 1988) might also be taken into consideration. *Second*, it would also worth considering why an organizational climate (culture) that supports mutual trust, share of export related knowledge and frequent contact between organizational members may promote a reward scheme that sensitize employees to take initiatives to meet (or exceed) export related goals. *Third*, how management's commitment to exporting and top managements emphasis on EMO is translated into values, norms and behaviours through proper reward and training systems may be perceived differently at different levels of the organization. *Fourth*, export strategy formulation may eventuate in clear marketing objectives and these objectives may be translated (and implemented) into behaviours only if resources, power structure, organizational politics and a wide range of individual goals – various organizational members share – are orchestrated towards achieving export market-related strategic objectives. *Fifth*, how the quality management, TQM, service quality in general and the use of the ENQA-ESG specifically, could be combined with the export market-orientation (EMO)? Future studies might want to study the complex interaction of the above factors, as well.

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APPENDICES

Appendix 1

Measurement Items and Factor Loadings

Scale	Loading
Top management's emphasis on export market-orientation (1 = don't agree, 9 = totally agree) CR = 0.88, AVE = 0.71	
1. It is essential to adjust to observed changes in foreign markets.	0.73
2. Our employees must react to the steps of our main competitors in foreign markets sensitively.	0.92
3. All our employees should seek to meet the emerging needs of our international students.	0.84
Management's commitment to exporting (1 = don't agree, 9 = totally agree) CR = 0.87, AVE = 0.69	
1. The management of our higher education institution considers efforts related to the recruitment of foreign students important.	0.72
2. The management of our higher education institution considers an important goal to increase the activity related to the recruitment of foreign students.	0.93
3. The management of our higher education institution is actively seeking international market opportunities.	0.82
Export market-oriented reward systems (1 = don't agree, 7 = totally agree) CR = 0.77, AVE = 0.53	
1. The performance of crew commissioned with foreign student recruitment is measured on how strong connections they build with foreign students.	0.71
2. Performance of our crew commissioned with foreign student recruitment is evaluated on the bases of surveys among foreign students.	0.74
3. With our reward systems we encourage our employees to step up their efforts to meet the needs of foreign students.	0.73
Export market-oriented training systems (1 = don't agree, 7 = totally agree) CR = 0.88, AVE = 0.71	
1. Our management supports training courses that help employees to become more oriented towards foreign students.	
2. We tell to our new colleagues that serving international students is a top priority.	0.96
3. New member of our staff will learn the importance of exploring the needs of foreign students.	0.89
Export market-orientation (EMO) (1 = strongly agree, 7 = strongly disagree)	0.61
<i>Export intelligence generation</i> CR = 0.85, AVE = 0.74	
1. We constantly monitor our level of commitment and orientation to serving foreign student needs.	0.91
2. We collect a lot of information to understand the factors influencing foreign students' needs and expectations.	0.80
<i>Export intelligence dissemination</i> CR = 0.92, AVE = 0.69	
1. Too much information concerning our foreign competitors is discarded before it reaches decision makers. (R)	0.89
2. Information which can influence the way we serve our foreign students takes forever to reach the staff that deals with foreign student issues. (R)	0.87
3. Important information about our foreign students is often "lost in the system." (R)	0.87
4. Information about our foreign competitors' activities often reaches relevant personnel too late to be of any use. (R)	0.79
5. Important information concerning export market trends (regulation, technology) is often discarded as it makes its way along the communication chain. (R)	0.68
<i>Responsiveness</i> CR = 0.87, AVE = 0.69	
1. Our export business strategies are driven by our beliefs about how we can create greater value for foreign students.	0.86
2. Our export strategy for competitive advantage is based on our understanding of foreign students' needs.	0.89
3. Our export business objectives are driven primarily by student satisfaction.	0.71
Export experience (1 = poorly developed skill, 7 = highly developed skill) CR = 0.93, AVE = 0.76	
In our higher education institution, we have developed	
1. ... the ability which allows identifying information from foreign markets.	0.90
2. ... an information base, which contains 'sales opportunities' on foreign markets.	0.84
3. ... an information base, which contains regulations/legislations about foreign markets.	0.91
4. ... the ability that would help us to understand how we will be able to prepare the best possible market research on foreign markets.	0.81
Size of the institution	
How many full-time students are studying at your higher education institution in the 2011/2012 school year?	–
Degree of internationalization	
The ratio of international students in full-time students.	–
Export market performance (1 = very dissatisfied, 7 = very satisfied) CR = 0.87, AVE = 0.76	
1. To what extent are you satisfied with the pace of entering new markets for student recruitment?	0.86
2. To what extent are you satisfied with the pace of entering new markets for student recruitment compared to main competitors?	0.88

Set Memberships and Calibration Measures and Sample Descriptives (n = 131)

Condition	Fuzzy-set/ measure	Fuzzy-set calibration			Measures descriptives			
		Fully in	Crossover	Fully out	Mean	S.D.	Max	Min
Top management's emphasis on export market-orientation (tmeemo_c)	A signal (from managers) about the importance of being responsive to export customer needs.	8.00	6.00	4.00	6.90	1.74	9.00	1.00
Management's commitment to exporting (mce_c)	A purposeful allocation of organizational resources to the organization's foreign trade operations.	8.00	6.00	4.00	7.46	1.63	9.00	2.00
Export market-oriented reward systems (emors_c)	Export market-oriented reward systems motivate employees to enhance export market behaviour and related actions.	8.00	6.00	4.00	3.59	1.56	6.50	1.00
Export market-oriented training systems (emots_c)	Export market-oriented training systems sensitize employees towards export customer needs.	6.00	4.50	2.50	4.62	1.76	7.00	1.00
Export market orientation (EMO) (emo_c)	A continuous approach on sensing and acting on events and trends in present and prospective export markets.	6.00	4.70	3.00	4.82	1.16	7.00	2.00
Export experience (eexp_c)	The ability to identify information and sales opportunities from foreign markets.	6.00	4.00	2.00	2.85	1.36	7.00	1.00
Size of institution (size_c)	Number of full-time students.	21,015	9,850	4,210	12,019.61	7,522.18	2,4426.00	646.00
Proportion of international students (int_c)	The ratio of international students in full-time students.	0.09	0.04	0.01	0.05	0.05	0.30	0.00
Export market performance (EMP) (expp_c)	Satisfaction with the pace of entering new markets for student recruitment compared to main competitors.	6.00	4.00	2.00	3.72	1.49	7.00	1.00

The names and main indicators of all institutions analysed in the survey, ranked according to their export performance

Name of the higher education institute	Abbreviation	Number of students	Number of international students	Proportion of international students (%)
Debreceni Egyetem	DE	29,714	3,741	12.59
Dunaújvárosi Főiskola	DF	2,714	125	4.61
Pázmány Péter Katolikus Egyetem	PPKE	7,910	293	3.70
Kecskeméti Főiskola	KF	3,733	88	2.36
Szegedi Tudományegyetem	SZTE	23,697	2,369	10.00
Budapesti Gazdasági Főiskola	BGF	15,593	480	3.08
Szent István Egyetem	SZIE	14,772	1,292	8.75
Nyugat-Magyarországi Egyetem	NYME	10,097	273	2.70
Pannon Egyetem	PE	7,335	145	1.98
Miskolci Egyetem	ME	10,882	165	1.52
Pécsi Tudományegyetem	PTE	21,819	2,102	9.63
Eszterházy Károly Főiskola	EKF	6,373	130	2.04
Semmelweis Egyetem	SE	12,920	3,209	24.84
Eötvös Lóránd Tudományegyetem	ELTE	28,698	1,855	6.46
Óbudai Egyetem	OE	12,653	272	2.15
Budapesti Corvinus Egyetem	BCE	14,173	1,668	11.77
Liszt Ferenc Zeneművészeti Egyetem	LFZE	863	147	17.03
Moholy László Művészeti Egyetem	MOME	994	86	8.65
Széchenyi István Egyetem	SZE	10,668	399	3.74
Nyíregyházi Főiskola	NYF	4,808	187	3.89
Budapesti Műszaki és Gazdaságtudományi Egyetem	BME	24,256	1,166	4.81
Károly Róbert Főiskola	KRF	5,698	40	0.70
Magyar Képzőművészeti Egyetem	MKE	764	61	7.98
Kaposvári Egyetem	KE	2,977	114	3.83
Eötvös József Főiskola	EJF	781	18	2.30
The observed 25 institutions together	-	274,892	20,345	7.40
All HE institutions in Hungary	-	320,124	23,208	7.25
Proportion of the 25 universities	-	85.87	87.66	6.44

FIGHTING SHADOWS? THE CONCEPT AND EMERGENCE OF ABLEISM IN SOCIETY AND AT THE WORKPLACE

ÁRNYÉKHARC? AZ ÉPSÉGIZMUS FOGALMA ÉS MEGJELENÉSE A TÁRSADALOMBAN ÉS A MUNKAHELYEN

Ableism is both an ideology and a belief system that privileges ableness and normality considering disability as a lower form of human existence and rendering people with disabilities invisible. Based on a literature summary, the current paper intends to describe the concept and roots of ableism and to show how it is manifested in society and the labour market as well as within the individual. It also introduces some research that uses ableism as an analytical tool to address issues of marginalisation and discrimination. The results provide insight into the broad and complex ways in which ableism can influence and constrain the opportunities of people with disabilities and their responses to social challenges. The paper aims not only to raise awareness of ableism as a potential form of oppression for interested academic researchers, university students, and diversity practitioners, but also to encourage them to conduct further research and identify ways of eliminating it.

Keywords: ableism, people with disabilities, labour market

Az épségizmus egy olyan hiedelemrendszer és ideológia, amely a normalitást és az épséget részesíti előnyben, a fogyatékossgot az emberi lét alacsonyabb értékű formájának tekinti, és a fogyatékossgal élő embereket marginalizálja. Jelen szakirodalmi összefoglaló cikk célja, hogy bemutassa az épségizmus fogalmát és gyökereit, valamint azt, hogy miként jelenik meg ez az ideológia a társadalomban és a munkaerőpiacon. A szerzők írásukkal betekintést szeretnének nyújtani abba, hogy az épségizmus milyen összetett módon befolyásolhatja és korlátozhatja a fogyatékossgal élő emberek lehetőségeit, a társadalomban és a gazdaságban való részvételét. A tanulmány célja egyik oldalról az, hogy felhívja az érdeklődő kutatók, egyetemi hallgatók és a diverzitással foglalkozó szakemberek figyelmét az épségizmusra, mint az elnyomás lehetséges formájára, másik oldalról az, hogy az olvasókat további kutatásokra és a jelenlegi helyzet megváltoztatására ösztönözze.

Kulcsszavak: épségizmus, fogyatékossgal élő emberek, munkaerőpiac

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Authors/Szerzők:

Dr. Sára Csillag¹ (csillag.sara@uni-bge.hu) PhD, associate professor; Carmen Svastics² (svastics.carmen@barczy.elte.hu) assistant lecturer; Dr. Anna Laura Hidegh³ (anna.hidegh@uni-corvinus.hu) PhD, associate professor; Dr. Zsuzsanna Győri¹ (Gyori.Zsuzsanna@uni-bge.hu) PhD, associate professor

¹Budapest Business School (Budapesti Gazdasági Egyetem) Hungary (Magyarország); ²Bárczi Gusztáv Faculty of Special Needs Education of Eötvös Loránd University (Eötvös Loránd Tudományegyetem Bárczi Gusztáv Gyógypedagógiai Kar) Hungary (Magyarország); ³Corvinus University of Budapest (Budapesti Corvinus Egyetem) Hungary (Magyarország);

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The focus of considering and researching the situation of people with disabilities (PWD) has recently shifted from disability itself to exploring the attitudes and behaviour of mainstream society (Calder-Dawe et al., 2020). In parallel with the spread of the social model of disability that emphasises the responsibility of society in creating barriers (Barnes & Mercer, 2005; Györi & Csillag, 2019a; Oliver, 1995), there has been a growing awareness of the various forms of social oppression that PWD face: discriminative social practices, unfavourable discourses, and institutional oppressive mechanisms that continue to marginalise and keep PWD passive, vulnerable and dependent (Csillag et al., 2018). The concept of ableism – like the notions of sexism, racism, or antisemitism – is increasingly understood as disability oppression based on the socially constructed norms of ableness as value, operating on many levels (e.g., institutional policy and practice, cultural norms and representations, individual beliefs and behaviours). As ableism is generally invisible, it transcends everyday life, which makes any form of counteraction difficult: like fighting shadows.

In this paper, after presenting the method of the literature review conducted, we discuss the concept of ableism and its origins, then we present its manifestations on individual, social and labour market levels addressing possibilities of counteraction as well. Our explorative research question is how ableism as a concept manifests itself in the scientific literature. In Hungary, several research communities are actively engaged in studying the social and labour market participation of PWD (e.g., Balázs-Földi & Dajnoki, 2016; Cseh, 2014; Csillag et al., 2018; Dajnoki, 2012; Hidegh & Csillag, 2013; Koller, 2020; Könczei & Hernádi, 2015; Szellő & Cseh, 2018; Zádori & Nemeskéri, 2019). Still, there is very little research on or applying the framework of ableism in management and organization studies. Our aim is to provide a summary for students, researchers and professionals working in the field of disability, and to encourage interested readers to further reflect, research and raise questions concerning the issue at hand.

The process of collecting the literature

In order to explore the concept and phenomenon of ableism, a systematic literature review (Denyer et al., 2009) was carried out using the Scopus database. We chose Scopus because our initial, exploratory searches in other available databases (EBSCO, JSTOR, Emerald) yielded significantly fewer hits. We illustrate the literature search process in Figure 1.

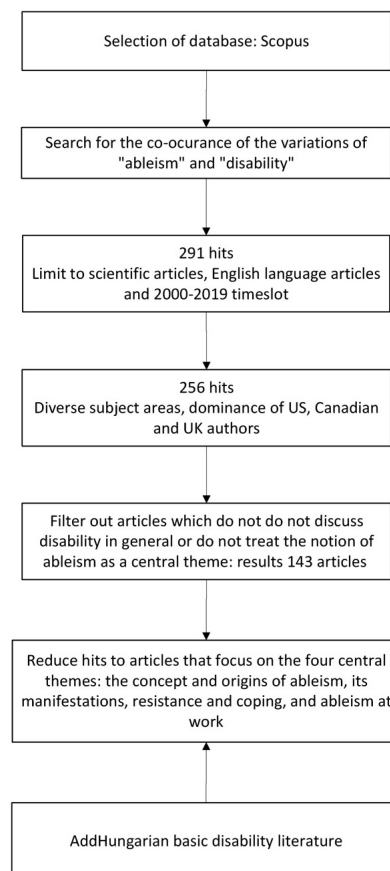
The database was first searched for the co-occurrence of the variations of ableism (“ableism” or “ableist”) and disability (“disability” or “disabled”), thus the first round of searches yielded 291 results. We narrowed this down to scientific articles published in English between 2000 and 2019. The 256 hits were not further narrowed down to subject areas, so the background of the articles was very diverse (the most common areas were Education Research 63, Rehabilitation 58, Psychology 55, and Sociology 40

articles, respectively). More than three-quarters of the articles (199 articles) were from the USA, Canada, and the UK. The distribution of articles over time shows that more than half (143 articles) were published between 2017 and 2019, i.e., interest in the topic has been growing extensively. Among the journals, *Disability and Society* (36 articles) and the *Journal of Social Issues* stand out – the latter also published a special issue focusing specifically on ableism in 2019. We illustrate the diversity of articles in the online Appendix (Figures 2-5).

By reading through the abstracts, we next filtered out articles that did not discuss disability in general but focused on a specific impairment (e.g., autism or spinal cord injuries), or on specific life situations (e.g., childhood, migration, legal cases). The remaining studies included in the analysis treat the notion of ableism as a central theme, most of them originate from the social sciences, behavioural sciences, or psychology. The articles were processed partly deductively, along with predefined aspects (e.g., concept and its origins, labour market presence), and partly inductively, along themes that emerged during reading (e.g., coping, internalised ableism, othering). In the present paper we wish to summarise the findings of the 93 relevant articles found along four lines: the concept and origins of ableism, its manifestations, resistance and coping, and ableism at work.

Figure 1

Process of the collection of the literature



Source: own edition based on Scopus results

The concept and origins of ableism

The notion of ableism has its origins in the human rights movement of the USA (Campbell, 2014), and much of the related theoretical and empirical work is rooted in Disability Studies, an academic discipline that has evolved around disability as a social, cultural, economic, and political phenomenon (Bogart & Dunn, 2019; Campbell, 2008; Wolbring, 2012). According to its most widely accepted definition, ableism is *“a network of beliefs, processes and practices that produces a particular kind of self and body (the corporeal standard) that is projected as the perfect, species-typical, and therefore essential and fully human. Disability then is cast as a diminished state of being human.”* (Campbell, 2009, p. 5) The definition itself is based on the idea that disability is socially constructed, that is, the physical condition or impairment itself is only partially relevant, and it is mainly the disabling practices of society that cause disability and a narrow understanding of ability (Nario-Redmond, 2020; Thomas, 2004). As a normative ideology and belief system that privileges the able-body and ableness over disability, ableism has also become an analytical tool and framework for analysing the functioning and persistence of this system of preferences and reveal the systematic marginalisation and exclusion of PWD from social life (Hutcheon & Wolbring, 2013; Jammaers et al., 2019).

The basic assumption behind ableism is that disability is ontologically negative (Hughes, 2007). The disabled body is seen as abnormal, which therefore needs to be corrected or cured (Oliver, 1995). Considering PWD as sub-human and inferior legitimizes the existing status-quo and justifies their segregation and oppression (Branco et al., 2019). A fundamental feature of ableism is that it is a binary system in which people are classified by their visible or publicly acknowledged impairments into artificially constructed and maintained categories, such as able-bodied or disabled (Campbell, 2009). Ableism refers to a ‘constitutional divide’ involving a separation of the notion of the normative ‘human’ person from the ‘aberrant’, referring to beings as ‘subhuman’ (Rieck et al., 2019). Although attempts have been made to have a continuum of abilities accepted (Rocco, 2005), the disabled/non-disabled dichotomy has persistently contributed to the hierarchy between PWD and non-disabled people, the dominance of the latter and the oppression of the former (Jammaers et al., 2019).

In an ableist social hierarchy and power structure, the ‘able body’ becomes the benchmark against which the person with disabilities can only become ‘the other’. Othering is the phenomenon of differentiating oneself from ‘others’, constructing a positive self-identity *“through what it is not”* (O’Mahoney, 2012, p. 729), building anti-identities, or engaging in dis-identification (Alvesson et al., 2008). Various groups can be ‘othered’ based on social characteristics like gender, age, sexual orientation, or even weight. Othering affects PWD seriously, as they are labelled and sometimes even stigmatized as outsiders, not fitting within the norms of non-disabled people as a

social group (Mik-Meyer, 2016). Othering also draws attention to the discursive levels of disability: disability may not only be interpreted as a condition but also as a material and discursive phenomenon that repeatedly appears in social processes (Mik-Meyer, 2016). Focusing on how ableism nurtures othering allows a way to see the intricate machinery behind societal prejudice and stigma (Dosch, 2019). Othering can also be a source of resistance, supporting the development of counter-narratives against hegemonic discourses (O’Mahoney, 2012) such as ableism or masculinity.

Forms and variations of ableism

According to feminist disability studies, ableism is the most dominant disability narrative in Western societies (Tarvainen, 2019). Ableism is often invisible (like a shadow), difficult to identify, and ableist principles are often not consciously reproduced in everyday life and in the functioning of institutions. Ableism in fact is just as present in culture and art as it is in inaccessible transport, discriminatory corporate recruitment practices or disability-based violence. It covers a wide range of acts from ‘innocent’ comments (microaggression) (Sue, 2010) to euthanasia programmes or selective abortion (Gent, 2011). Its validity is not in question, despite the fact that the condition of ableness is in a sense only temporary, and we are all ‘temporarily able-bodied’. As bodily functions may decline with age, physical limitations may be experienced sooner or later by all who live long enough (McRuer, 2006).

There are different categorisations of ableism depending on the various conceptualisations or models of disability and the disciplinary backgrounds of the given approach. While Wolbring (2008, p. 253) distinguishes among four areas of ableism (biological structure-based ableism, cognitive-based ableism, social structure-based ableism, and economic system-based ableism), Chouinard (1997) stresses that ableism is simultaneously present at several levels, in systems of ideas, institutional practices and social relations. Compared to the more obvious and visible disadvantages at the social level, it is often difficult to pinpoint the more indirect, discursive, or interpersonal discriminatory forms of ableism. Research and initiatives focusing on the socio-cultural barriers of disability have, according to Critical Disability Studies, taken little account so far of the personal and psycho-emotional dimensions (Reeve, 2002, 2004). As Thomas (2007, p. 72) formulates, *“social barriers ‘out there’ certainly place limits on what disabled people can do, but psycho-emotional disability places limits on who they can be by shaping individuals’ ‘inner worlds’, sense of ‘self’ and social behaviours”*.

In case macro and micro levels of ableism are regarded, it is reasonable to distinguish between structural-public and individual, psycho-emotional forms (Sanmiquel-Molinero & Pujol-Tarrés, 2020). Structural-public ableism is embodied in political, economic, and social systems whose mechanisms systematically disadvantage all who do not qualify as able-bodied. Nario-Redmond (2020),

examining US data, shows that this oppression is present in virtually all areas of social life: most obviously in education, employment, and health care, but the negative effects spill over into areas such as political participation, relationships, or parenting. Psycho-emotional ableism or the psychological dimensions of disability oppression may have direct or indirect forms. Direct forms in interpersonal relationships may include gazing or avoidance, while an example for the indirect form may be the anger and frustration in the individual as a result of unsolved accessibility issues (Reeve, 2002, 2004, 2012). In peer relationships, ableism can manifest as fear, damage of reputation, or dehumanizing acts such as ignoring, objectification, or invasion of privacy (Nario-Redmond et al., 2019).

As another common form of categorisation, Nario-Redmond et al. (2019) distinguish the following three forms of ableism: hostile (negative), benevolent (positive), and ambivalent (mixed). The negative form is well documented and includes phenomena such as shaming, gestures of disgust, hostility and punishment, humiliation, or intimidation, through which the perpetrator seeks to assert his or her own superiority by denying the humanity of others. Features of benevolent ableism include exaggerating the achievements of PWD, admiration for overcoming disadvantages, patronising, and providing unsolicited help.

Ableism most often takes a mixed, ambivalent form, with both positive and negative emotions like paternalistic/condescending and jealous/envious, and its perception depends on the situation, intentions, needs and personality traits of the participants (Nario-Redmond et al., 2019). For example, while a small and unobtrusive hearing aid may not evoke negative emotions, a highly visible, 'robotic' cochlear implant may cause confusion in someone who has not yet encountered it. Or even though one knows in theory that one should be kind and accepting towards PWD, in the actual situation one may feel uncomfortable, embarrassed, and anxious at the same time.

The Stereotype Content Model, which was developed to describe mixed reactions and behaviours observed in social interactions, predicts and groups the emotions and typical behaviours commonly elicited by a social group based on its status and competitive nature (Fiske et al., 2002; Nario-Redmond et al., 2019). Accordingly, PWD (low status and low competitive status) are associated with warmth but incompetence, like the elderly and housewives who arouse pity, sympathy, and a need to be protected but are also seen as subordinate. The often-mentioned feeling of pity, for example, is an emotional mix of tenderness and anxiety, and can trigger both aloofness and a desire to care, especially if the person is perceived as vulnerable and unable to help their condition. Pity can also include passive neglect (isolation) or ignorance, alongside active caring, as in segregated residential homes or charity fundraising, where PWD are often objectified and exploited for the sake of the cause. However, if PWD do not fit the expected image (e.g., the disability is self-inflicted, or PWD joke about their condition, refuse help or are "too" competent),

the reaction of the majority can quickly turn to blame, contempt or indignation.

Another aspect of ableism, maybe its most dangerous side, is that beside the societal and interpersonal levels, it can impact upon an individual, as a form of internalised ableism. If PWD themselves accept the majority perspective, a secondary or subordinate position, and perceive disability as a problem to be denied, hidden, or overcome (Dosch, 2019), this may cause significant psychological distress. Concealing disability in order to fit in with the majority, avoiding peers so as not to be perceived as similar, or accepting socially assigned ableist roles as 'hero' or 'role model' (Campbell, 2009; Dunn, 2019) can cause psychological distress and may result in anxiety or even depression, n. The terms 'supercrip' (Shakespeare, 1996) or 'inspiration porn' (Grue, 2016) refer to PWD who, while performing everyday activities, are seen as objects of admiration or are fetishized for 'extraordinary' achievements. The media may sensationalise, for example, a child doing sports with a prosthetic leg, a hearing-impaired person speaking foreign languages, or a weightlifter in a wheelchair as something special and, though the phenomenon may seem positive in terms of recognition, it is also paternalistic and condescending because of the apparent low expectations.

If no meaningful action is taken against other forms of ableism, internalised ableism will have a strong impact on the identity and self-image of a PWD: the individual may have a low opinion of themselves and their abilities and potentials, may question their self-worth, consider themselves as outsiders of society and a burden to others, and have little social contact and support network. The constant experience of low self-esteem and feelings of inferiority might even lead to self-hatred and self-destruction (Shakespeare, 1996), a negative spiral or vicious circle that is very difficult to break.

Possible forms of resistance to ableism

Despite the pervasive and permeating nature of the phenomenon of ableism, the possibility of counteraction and resistance, as in all power relations, is there for PWD (Wade, 1997). Their resistance arises from and against power itself as the oppressor and the oppressed are part of the same system, and their struggle is in dynamic interaction (Foucault, 1997). Although oppression is felt at all levels of life and there is strong pressure on individuals to take consequences for granted, even reinforce and reproduce them, there is noticeable and increasingly documented scientific evidence pointing to the various forms of coping strategies PWD might employ (Loja et al., 2013). The following is a summary of the main possible forms of resistance documented in the literature, which aim to go against the norms of ableism and give a new perspective, a vision of equality and a possible partnership between people with and without disabilities that ultimately promotes social justice.

Thematization of resistance to power mainly draws on the concept and definition of oppression. In their stigma

theory, Holley et al. (2012) differentiate between social/cultural/institutional (macro) and individual (micro) levels of oppression. For Critical Disability Studies, the lived experience of marginalised people becomes important in confronting socially constructed normality, challenging dominant ideology by seeing the difference, diversity and marginality as values and a terrain for resistance (Titchkosky & Michalko, 2009). The recognition of ableist norms has also been reflected in the critical revisions of many disciplines, and the need to rethink previously generalised psychological concepts such as ‘coping strategies’ and ‘resilience’ has emerged (Hutcheon & Wolbring, 2013).

On a macro level, in socio-political terms, the emergence of the social model of disability (Bailey et al., 2015; Oliver, 2013) itself can be understood as a kind of resistance that developed against the medical model of disability making disability a ‘problem’ to overcome, fix or erase. Changing the general assumption that disability is inherently negative seems important, as *“in everyday life the negative ontology of disability and the particularities of prejudice and oppression tend to reassert themselves. Moreover, this sociological claim reaffirms the hegemony of the ontological view that human worth is closely associated with ability.”* (Hughes, 2007, p. 678) Replacing the former negative ontology and reinforcing a positive self-image has become a central task of human and civil rights movements and identity politics, with the disability community empowered through a shared disability culture, disability pride and the celebration of difference around the world (Loja et al., 2013). The slogan ‘Piss on Pity!’, also used in political protests, expressively sums up the radical resistance to ableism.

At the level of academic, political, or even practical cooperation, it has become an increasingly important strategy for the disability movement to seek an alliance with social minorities (women, ethnic minorities, or elderly people, etc.) in similarly oppressed situations. On the one hand, this supports learning from each other, and reduces the risk of further social minority isolation. On the other hand, social networks with relatively weak links can benefit from heterogeneity (Langford et al., 2013).

While Critical Disability Studies have moved towards the exploration of multiple identities and intersectionality (Goodley, 2017), a discursive approach to disability has turned its attention to the power role of language. The use of politically correct, respectful language has emerged as an expectation instead of the use of ableist or disrespectful language, and ‘person with a disability’ as opposed to ‘disabled person’ has become the new standard term in the context of the USA, following the people-first logic (Svastics, 2019).

Macro-level collective action against ableism is only possible if it derives from individual struggles, micro-resistances. Personal reactions and responses to ableism are highly diverse, depending on situations, as well as the various goals, needs and personalities of individuals. Recognizing and realistically interpreting the devaluing public and interpersonal messages is in itself an

achievement, as a fundamental condition of resistance is for the individual to be aware of his/her own oppression (Freire, 2001; Prilleltensky, 2003). McDonald et al. (2007) distinguishes two basic personal strategies of mitigating the negative social impacts of oppressive narratives: the individual either withdraws from the environment (e.g., leaving, leaving the relationship, abandoning the activity) or reframes the dominant cultural narratives. The latter case comprises three options: reducing the validity of the narratives (e.g., self-definition, independent decision making), perceiving disadvantages as motivation (e.g., assertion, confronting low expectations, rejecting labelling), or replacing pejorative narratives with positive, personal manifestations (e.g., positive thinking, self-love). In the case of stigmatized individuals, Bos et al. (2013) differentiate between problem-focused coping (e.g., selective disclosure of disability; compensation in social interactions being particularly outgoing or avoiding others altogether; activism) and emotion-focused strategies (e.g., downward social comparison, ignorance or distraction).

Self-determination, as the exercise of agency and control, plays a significant role for both the individual and the community (Bandura, 2000; Loja et al., 2013). The formerly common ‘disability narrative’ (Shakespeare, 1996) has been replaced by new narratives, diversifying the palette of possible identities. New strategies for identity management emerged, making intersecting identities and situational identities possible (Könczei & Hernádi, 2015). Furthermore, it has been shown that embracing disability identity as an active resistance to ableism has a number of benefits (e.g., self-esteem, self-efficacy, peer support, and life satisfaction) besides reducing psychological distress (Bogart et al., 2017).

While resistance is always possible, it often comes at a price, which may vary across disability groups (Wang et al., 2019). Despite being risky as it may threaten a person’s status and acceptance, countering verbal abuse (i.e. hate speech, microaggression, mocking, etc.) through for example, talking back, writing a complaint, or blogging, is a technique of self-defence and self-expression for which the internet and virtual space can provide sufficient safety (Loja et al., 2013). The negative effects of ableism, which can also be a heavy mental burden because of self-denial or the risk of being ‘caught’, can be avoided – even if temporarily – through masking or camouflaging (Evans, 2019; Vickers, 2017). Rejection of peers and challenging their self-exoneration and self-justification for the difficulties experienced by those who are successful in mainstream society may also function as self-defence. The aim is usually to defend one’s own positive self-image and identity (Watts-Jones, 2002).

The myth of the perfect body, *“the belief that it is possible by means of human actions, to have the bodies we want and to avoid illness, disability, and death”* (Wendell, 1997, p. 9) is oppressive not only to PWD but also to non-disabled people. Although dividing the physical and mental-emotional dimensions of impairment, i.e., disembodiment (Hernádi, 2014), is a documented individual coping strategy, in fortunate cases

it is complemented by social initiatives that challenge existing ideals of beauty or handsome appearance and the existing parameters of the acceptable body. Recognising the existing sexuality associated with PWD, breaking down pervasive stereotypes (e.g., asexual, unattractive, emasculated) and redefining physical normality in socio-cultural terms, e.g., through beauty contests, photo exhibitions, successful role models, and media campaigns are increasingly common solutions that have a significant impact on both public perception and the self-acceptance and positive self-image of the PWD (Barnes, 1992; Lamb, 2001).

Ableism in the labour market and in the world of work

According to ableist norms, the capitalist system has traditionally regarded PWD as less productive and less reliable. In sum, they are considered incapable of meeting the expectations of the economy and are the opposite of the ideal worker who is ready to work and contribute to society, the economy, and creates value (Goodley, 2014). In the globalised neoliberal economy, there is a persistent negative representation that portrays PWD as difficult to employ and unproductive, and thus excludes them from the world of work or forces them into inferior positions. In the work society, work becomes a moral category. Regardless of the actual ability of the individual to work, those unwilling or unable to work, i.e. who do not fit the generally accepted ideals of the workforce, become not only economically and socially but also morally inferior (Blattner, 2020). The notion of ‘neoliberal ableism’ introduced by Goodley (2014) seeks to draw attention to the mutually reinforcing effects of neoliberalism and ableism, which portrays disabled people as the antithesis of responsible citizens with good work ethics and a desirable, productive labour force.

The concept of the ‘inequality regime’ is associated with Acker (2006, p. 443), who defines it as “*loosely interrelated practices, processes, actions, and meanings that result in and maintain ... inequalities within particular organizations*”. The unequal relations are upheld at the cultural-symbolic level by the image of the ideal worker, who is unencumbered, available to the organisation at all times, prioritises work over private life and is expected to work overtime (Acker, 1990, 2006). The image of the ideal worker is as incompatible with that of a woman who has to care for others as it is with that of PWD, especially when ableist stereotypes are attached. In a workplace based on the rules of the meritocracy game, nothing should be allowed to distract the worker from work. In their research, Jammaers et al. (2019) highlight that human resource management processes based on the image of the ideal worker in a company lead to ableist conditions and, in Bourdieuan terms, to symbolic violence against workers with disabilities.

Ableism in corporate operations can be linked to the concepts of entry and process discrimination (Csillag et al., 2018; Györi & Csillag, 2019b; Jones, 1997). According

to the ableist narrative of recruitment and selection, the disabled candidate is incompetent, needy, and vulnerable, an image that does not coincide with that of the flexible, multitasking, productive and interchangeable ideal candidate. Rocco and Collins (2017) conclude that a candidate with a disability is often perceived as lazy and assumed to be dishonest about their physical or mental condition (Rocco & Collins, 2017). Because (s)he differs from the fixed and idealized image of the perfect employee, a worker with disability would be difficult to fit into the organizational culture or be acceptable to other employees based on the logic of ableism (Jammaers et al., 2016). As a result, many job seekers, where possible, conceal or disguise their disability or the lack of an ability (Vickers, 2017). Physical and digital accessibility can facilitate access to organisations, but it does not fundamentally change the nature of ableism as an organising principle or the ableist character of work organisation. The costs of accessibility are often made out to be disproportionately high and the ‘privileges’ given to workers with special needs do not correspond to an ableist hierarchy and make it uneconomical to employ (supposedly) less productive workers with disabilities (Hastbacka et al., 2016). Procknow and Rocco (2016), in their review of the literature on human resource development, also identified entry barriers generated by PWD for themselves. This includes self-questioning, doubt in one’s own abilities, and self-sabotage, factors which – although not mentioned in the article – often arise from internalised ableist norms (Procknow & Rocco, 2016).

Process discrimination means that a worker with a disability has fewer opportunities to demonstrate their performance, fewer opportunities for development, slower progression through the organisational hierarchy and less chance of becoming a manager. In many cases, they end up in so called ‘dead-end’ positions, their work is routine, their performance is unduly undervalued, they receive less pay and benefits, and they are dismissed more often (Csillag et al., 2018; Miceli et al., 2001). Another observed phenomenon, homophily, can also be a barrier to organisational advancement: workers with disabilities often seek contact with their peers or the organisation itself creates a separate department for them. This segregation within the organisation can significantly hinder the development of mutual sympathy, solidarity and acceptance among employees and the emergence of an inclusive work culture (Procknow & Rocco, 2016). From an ableist point of view, though the behaviour is understandable, the process contributes to the self-exclusion of employees and hinders genuine integration. In contrast, mentoring is of particular importance (McDowell, 2014 in Procknow & Rocco, 2016), as it can provide tailored support and a tacit transfer of knowledge in areas where the individual is in particular need, including the development of social competences. In the area of training and development, both trainings to support an open workplace culture and inclusion in general as well as trainings specifically targeting workers with disabilities, are important. Research shows that workers with disabilities are also in a more difficult position in

the last stage of the human resource flow model, as they are more often adversely affected by a wave of dismissals or become victims of unlawful dismissals (Procknow & Rocco, 2016), which is closely linked to the already mentioned process discrimination (Vickers, 2017; Zádori et al., 2020).

Examining the concerned population, Branco et al. (2019) pointed out that PWD who face an ableist social environment, perceive their health and well-being as significantly worse than in reality (Branco et al., 2019). If we accept that the subjective experience of well-being and happiness is significantly influenced by employment and the opportunity to engage in meaningful work, it is particularly important to dismantle ableist social stereotypes of disability that inhibit labour market integration, such as the widespread assumption that PWD have lower levels of competence (Cuddy et al., 2008 in Branco et al., 2019).

Although economic and financial vulnerability pose serious barriers to the labour market participation of PWD, resistance to ableist norms especially in discursive strategies are also documented. Jammers et al. (2016), examining the identity-work of employees with disabilities, uncovered three distinct patterns in individual responses to lower levels of competence and productivity. Those in the first group challenged the assumption that their work would be less productive and less efficient simply because they have a disability. In support of their argument, they pointed to their past successes, their high level of competence and often-cited examples of times when they had performed as well as their able-bodied co-workers. By arguing and constructing a positive identity, they successfully resisted the negative identity offered by ableist discourse. Still, by linking performance to the able body and failing to question the primacy of the performance principle in judging a person's worth (Jammaers et al., 2016), counterarguments in fact recreated and reinforced the generally negative picture of PWD.

In the second typical pattern, workers redefined productivity by emphasizing competencies in which they may be stronger than others, such as empathy or perseverance (Jammaers et al., 2016). However, in doing so, they also reproduced the ableist discourse that PWD are more characterized by positive, 'warm' qualities, referring to the aforementioned Stereotypical Content Model (Branco et al., 2019; Fiske et al., 2002; Nario-Redmond et al., 2019). Moreover, they argued for diversity management on business rather than on moral grounds, along the lines of neoliberal ideology that disfavors disadvantaged groups, rather than questioning the narrative altogether.

Paradoxically it is the third approach, accepting the assumption of lower productivity, that seems to have the potential of transforming neoliberal, ableist social discourse in the long run. Pointing out a collective responsibility that transcends the individual case in the matter is crucial: it is the ableist work environment – be it the built environment or the organisational climate – that makes workers with disabilities less productive. It is

also important to emphasise that there is an alternative understanding of workplace community or organisational membership that goes beyond performance and points towards a vision of society with a different organisational principle, based, for example, on moral and ethical grounds (Jammaers et al., 2016).

Another positive example is found in self-employment and entrepreneurship, which represent a new kind of 'micro-emancipation' in the world of work, in contrast to being an employee. Although neoclassical economics reinforces the ableist narrative by making entrepreneurship the driving force of the economy (Maroufkhani et al., 2018), and depicting the entrepreneur as an innovative, successful, strong, courageous and above all 'able' person (Cooney, 2008), entrepreneurship offers PWD the opportunity to redefine their social status, and choose a more positive entrepreneurial identity than that of disability (Csillag et al., 2020). However, due to the low number of entrepreneurs with disabilities and their low social, economic and political visibility and capital, their example cannot fundamentally change the general image of the worker with disability, and thus the ableist framework (Cooney & Licciardi, 2019; Csillag et al., 2020; Svastics et al., 2020).

Conclusion

In our study we have outlined the social and interpersonal effects of ableism, which contribute to the social oppression of PWD and the maintenance of the privileges of mainstream society through stereotyping, prejudice, and discrimination. We have provided insight into the broad and complex ways in which ableism can influence and constrain the opportunities of PWD for action and their responses to social challenges. Increasing awareness and overriding negative impacts, which may be taken for granted at the individual level, but which are compounded and amplified at the societal level, is not an easy task, but it is inevitable for the situation to improve, at least gradually and in the long run.

Highlighting the labour market, we have shown that to achieve real change, we need to dismantle unequal, ableist organisational regimes in the workplace. While disability can be compensated at the individual level through a variety of coping techniques and forms of resistance, the true solution lies in reforming collective social practices and human resource management processes that would transform disability into a positive value. Socio-economic processes pointing in this direction, the increasing participation of PWD in society, in the labour market and in politics, as well as the various forms of resistance and micro-emancipation uncovering the mechanisms of ableism, can, nevertheless, slowly lead to change.

While ableism has proved to be a useful tool for analysis, some criticism of the framework is also apparent, linked to reservations concerning the social model of disability (Owens, 2015). As Könczei and Hernádi (2011, p. 23) emphasise that *"one cannot ... conceive of disability merely as a social context (not at the individual level,*

but e.g., at the macro level). This is because it means losing, among other things, one's own experiences, one's own struggles and pain, which are all constitutive parts of living with a disability." Within this context, it is also important to consider and reflect on the physical-material-emotional reality of disability when examining the external frameworks of ableism. For a person with a disability, the direct bodily-physical and psychological experience of impairment is an everyday reality, to classify this exclusively as a construct of ableism is to deny and invalidate important personal aspects of disability. This attitude is open to criticism from a scientific point of view as well, since it risks reducing the complex phenomenon of disability to being one-dimensional. The active involvement and participation of PWD in academia and research (e.g. insider researchers, participatory research, and increase of disability content in education), as well as the search for and highlighting of their respective agency can also help to ensure that ableist social and economic discourses do not become normative and oppressive (hegemonic) discourses that exclude other aspects, but are linked to human rights, empowerment and emancipatory processes that promote change and progress.

Our aim with this paper was to summarise the basic ideas and give food for thought – and so we would like to conclude by suggesting some research possibilities somewhat arbitrarily from among the many possible directions for those interested. At the societal level, an exciting direction is the identification and analysis of disabling discourses in social, institutional, policy rhetoric and conversation, or the role of different social and economic stakeholders (e.g., government, rehabilitation organisations, organisations representing PWD, companies, NGO-s) in creating, re-creating or dismantling ableist normativity. A particularly intriguing issue is the political and social participation (or silence) of individuals with disabilities or that of the groups representing them, and the institutional, social, and personal mechanisms of its impact through the lens of ableism and internalised ableism.

In some parts of the world the issue of physical and/or digital accessibility is still very topical – its development and/or barriers could also be scientifically analysed along the lines of ableism. From a labour market perspective, it may be interesting to analyse corporate practices based on Critical Disability Studies and ableism as a framework for analysis: what inclusive or exclusionary HR systems and organisational cultures can be found in business practices, and how inclusive organisations can be developed to support human dignity and equal partnership. At the individual level, exploring both the impact of ableism on identity and the phenomenon of internalised ableism and othering can offer exciting areas for research.

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Appendix

The figures show some typical distributions of the articles identified in the literature collection based on the Scopus database.

Figure 2

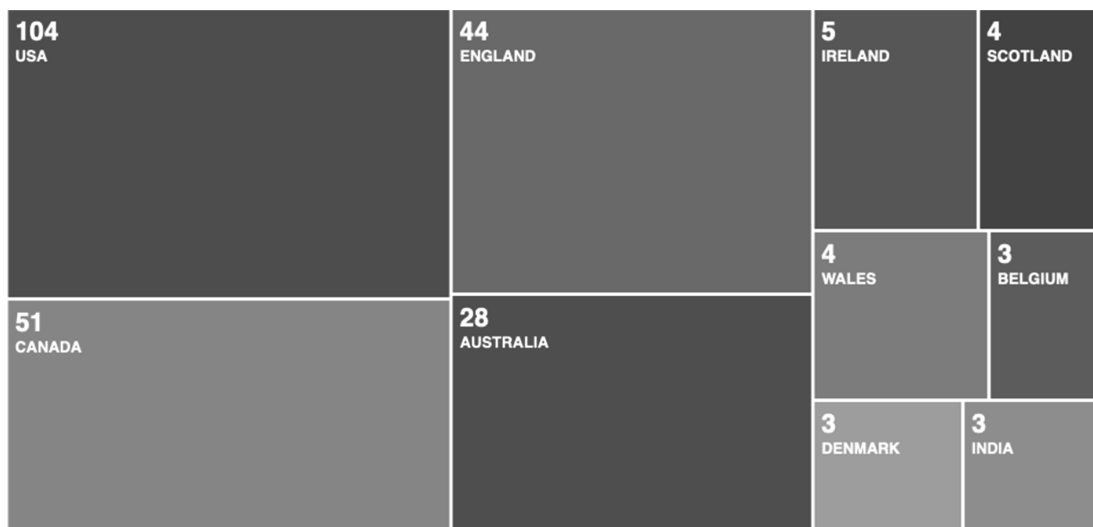
Distribution of articles by discipline



Source: Scopus database

Figure 3

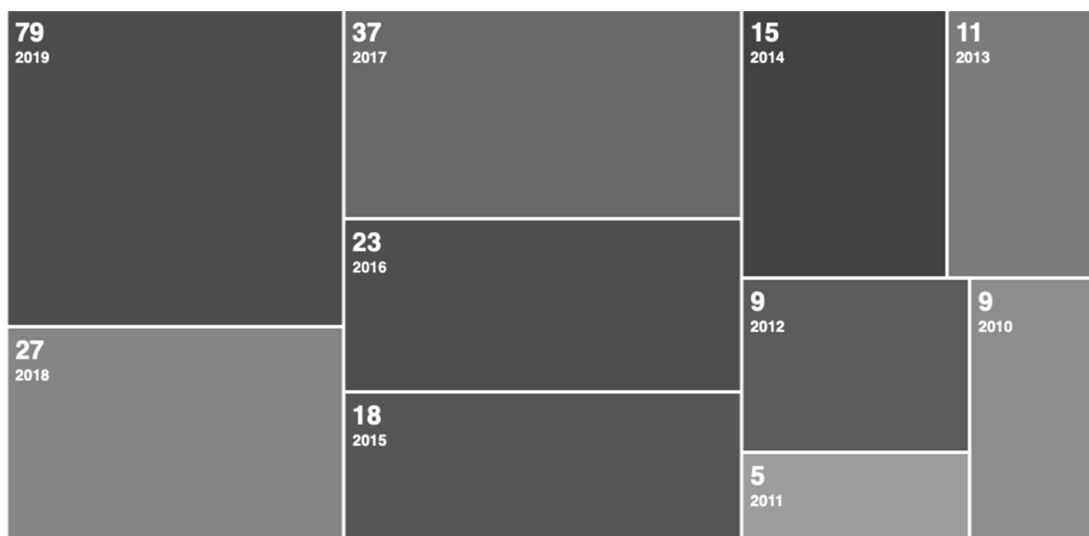
Distribution of articles by place of publication



Source: Scopus database

Figure 4

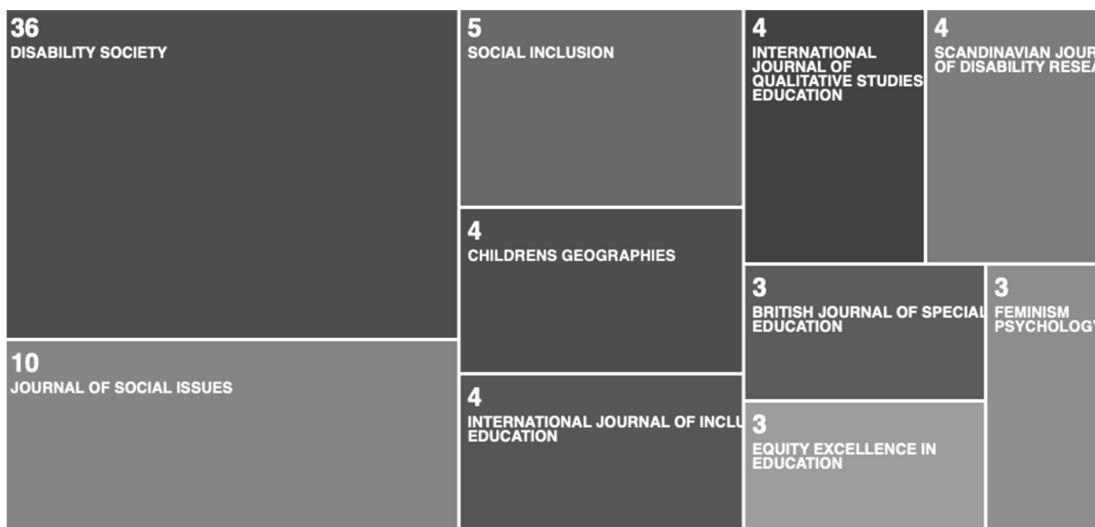
Distribution of articles by year of publication



Source: Scopus database

Figure 5

Distribution of articles by journal



Source: Scopus database

NASCENT ENTREPRENEURSHIP – A BIBLIOMETRIC ANALYSIS AND SYSTEMATIC LITERATURE REVIEW

SZÜLETŐBEN LÉVŐ VÁLLALKOZÁSOK – BIBLIOMETRIKUS ELEMZÉS ÉS SZISZTEMATIKUS IRODALMI ÁTTEKINTÉS

Nascent entrepreneurship studies contribute to the understanding of entrepreneurial intention of individuals which in turn has significant effects on economic growth and labour markets. This paper presents a systematic literature review of nascent entrepreneurship research focused articles published between 2000 and 2020 based on bibliometric analysis and quantitative and qualitative text analysis. A corpus of 257 journal articles was assembled to provide insights on the most important themes and trends in the research stream as well as focusing on the most prominent journal outlets and influential authors. In-depth examination of the 30 most cited articles serves as a basis for proposed systematisation of factors influencing nascent entrepreneurial intentions. A summary of promising research directions and emerging themes is also presented.

Keywords: nascent entrepreneurship, nascent entrepreneurs, systematic literature review, bibliometric analysis, text analysis

A munkahelyteremtésre és a gazdasági növekedésre egyaránt pozitív hatással van a vállalkozói kedv – a születő vállalkozások kutatása pedig jelentősen hozzájárul a vállalkozókedv mozgatórugóinak megértéséhez. A szerzők ebben a tanulmányban szisztematikus irodalmi áttekintés segítségével elemezik az elmúlt 20 év születőben lévő vállalkozások témakörében megjelent kutatásait. Az átfogó szakirodalmi áttekintést bibliometrikus elemzésre, illetve kvantitatív és kvalitatív szövegelemzésre alapozzák. A 257 folyóiratcikkből álló korpusz vizsgálata során feltárják e szűk kutatási terület legfontosabb kérdésköreit és tematikus trendjeit, azonosítják a legnagyobb hatású folyóiratokat és szerzőket. A témát érintő 30 legtöbbet idézett cikk mélyreható kvalitatív elemzése lehetővé teszi azt is, hogy javaslatot tegyenek a vállalkozókedvet befolyásoló tényezők átfogó rendszerezésére. Végezetül bemutatják a témával kapcsolatos új kutatási lehetőségeket, ígéretes irányzatokat is.

Kulcsszavak: születő vállalkozás, születőben lévő vállalkozók, szisztematikus irodalmi áttekintés, bibliometrikus elemzés, szövegelemzés

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Authors/Szerzők:

Krisztofer Szabó¹ (krisztofer.szabo@uni-corvinus.hu) PhD candidate; Dr. Márta Aranyossy¹ (marta.aranyossy@uni-corvinus) associate professor

¹Corvinus University of Budapest (Budapesti Corvinus Egyetem) Hungary (Magyarország)

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It is crucial for businesses, policy makers, and academic theoreticians to understand how an individual becomes an entrepreneur and how a new enterprise is created (Lukovszki, 2011; Szerb & Lukovszki, 2013; Teece, 2016). Entrepreneurship is in essence a process instigated by individuals to identify new opportunities and convert them into marketable products or services. (Schaper & Volery,

2004). Various theoretical and empirical models have been developed in entrepreneurship studies to explain the origin of new enterprises, many of which approach the subject matter through process driven orientation (Dimov, 2007; Van Gelderen et al., 2005; Harper, 2008; Teece, 2007). Nascent entrepreneurship is thus widely seen the first step of the entrepreneurial process (Davidsson, 2006).

A nascent entrepreneur is typically defined as an individual in the process of setting up a business (Reynolds & White, 1997). In this regard, such individuals can be considered as searching for opportunities to introduce new products or services, to serve new markets, or to develop more profitable production methods (Casson, 1982; Shane & Venkataraman, 2000; Korunka et al., 2003). The term “nascent entrepreneur” accordingly reflects current and ongoing efforts to create a new business (Hopp & Sonderegger, 2015). Nascent entrepreneurs are further defined by Hopp and Sonderegger (2015) as teams or individuals who (1) wish to start a new business, (2) have already performed activities in order to start a business, (3) expect to own at least part of a new business entity and (4) who do not own a currently operating business. Thus ‘nascent entrepreneurship’ may be defined as the initiation of activities aimed at establishing a viable new enterprise in the future (Hechavarria & Reynolds, 2009). Thus, the difference between a nascent entrepreneur and an actual entrepreneur essentially lies in the latter as an individual who has already started and operates an ongoing enterprise (Van Stel et al., 2007). This distinction forms the reasoning for our choice of exploring the nascent entrepreneurial literature without widening our focus to include all streams of literature on new business creation, business venture forms and startups. Research where the term ‘nascent entrepreneurship’ is deliberately used, focuses more on the intent and underlying factors influencing it rather than the act of actual new business creation. This aspect also serves as a partial basis for systematization in this article.

There is a general consensus among researchers that setting up a business can be considered as a deliberate act (Minniti & Nardone, 2007). Entrepreneurial intention is therefore one of the focal concepts of entrepreneurship research (Held et al., 2018; Shane & Venkataraman, 2000). Entrepreneurial activity as a process develops over time and especially in the early stages can be viewed as deriving from the cognitive processes of one particular individual (Bergmann & Stephan, 2013). Mitchell and Daniels (2003) moreover defined entrepreneurial motivation as a set of psychological processes that direct, energize, and sustain entrepreneurial action. The intention may be also derived from necessity or opportunity orientation (Huszák et al., 2021). The former construct is largely applied to entrepreneurs who start a business because they may currently consider available employment opportunities to be incomplete or unsatisfactory (Mitchell & Daniels, 2003). In contrast, opportunity-based entrepreneurship encompasses individuals who start their own businesses to take advantage of perceived entrepreneurial opportunities (Hechavarria & Reynolds, 2009; Kerékgyártó, 2021).

This paper therefore aims to summarize disparate research streams of nascent entrepreneurship by exploring and analysing the emerging themes of the literature with a special focus on the key factors of entrepreneurial intention. To attain this goal a systematic literature review was performed by focusing on scientific journal papers published between 2000 and 2020. Although in a

wider context literature on new business creation was not sparse before the turn of the millennium (i.e. Carter et al., 1996; Reynolds, 1997; Mazzarol et al., 1999; Westhead & Wright, 1998) the term ‘nascent entrepreneurship’ then also appeared sporadically (i.e. Reynolds & White, 1992). The Scopus database does not contain any articles with the term ‘nascent entrepreneur(ship)’ in the title or as keywords of papers published before 2000. As the aim of this paper is to explore nascent entrepreneurship in a more specific context, where authors deliberately place this specific term in the focus, our research examines articles published from 2000.

Bibliometric analysis also helps us understand how nascent entrepreneurship research has evolved in the intervening period and when and where researchers published their findings, and who have been the most prolific authors. Quantitative text analysis provides insights on the most important research themes and trends, while qualitative analysis of the most influential articles provides us with a more in-depth picture about how the topic is approached from various theoretic and methodological standpoints. While quantitative analytical techniques have been used to create literature reviews in the field of entrepreneurship (Laudano et al., 2018) our narrower focus on nascent entrepreneurship and additional qualitative analysis provides an element of novelty. The paper also contributes to theoretical debate by presenting a general framework to systematize factors influencing nascent entrepreneurship based on knowledge accumulated in the literature review.

Methodology

In order to identify relevant scientific articles for the comprehensive review the Scopus online database was used. This comprises a high quality, reliable and well-structured data source with manifold search and filtering options. For search and filtering purposes the keyword “*nascent entrepreneur(ship)*” was used. As previously mentioned, we deliberately decided to use just one specific family of search keywords, so that the literature corpus would only contain articles directly linked to the specific concept of nascent entrepreneurship. The 666 articles located by search of titles, keywords, or abstracts was too diverse for our purposes, so our search was subsequently restricted to papers containing the term “*nascent entrepreneur(ship)**” in their titles or keywords (see Figure 1), thus ensuring that the corpus only contained articles with explicit focus on this specific phenomenon. As preliminary database screening did not yield any studies with this keyword in the title or abstract published before 2000, the timeframe was set for 2000–2020. Cognizance is due to the possibility that the first featured use of the term ‘nascent entrepreneurship’ might have been preceded by divergent use of diverse terms with similar meaning. Thus, our review began with the more relatively delineated phase of nascent entrepreneurship research from 2000 to yield a final corpus of 257 scientific articles.

Figure 1

Systematic compilation of the database

Steps	Search	Restrictions	Number of papers
1 Base search	<ul style="list-style-type: none"> SCOPUS database Keyword: "nascent entrepr*" 	<ul style="list-style-type: none"> Title, Keywords, Abstract Journal articles only 2000-2020 Business, Management and Accounting 	666 different articles
2 Filtered search	<ul style="list-style-type: none"> SCOPUS database Keyword: "nascent entrepr*" 	<ul style="list-style-type: none"> Only Title OR Keywords Journal articles only 2000-2020 Business, Management and Accounting 	257 different articles
3 Final search	<ul style="list-style-type: none"> SCOPUS database results Selecting the TOP 30 articles 	<ul style="list-style-type: none"> Selecting the most cited papers Filtering content by abstracts 	30 selected articles

Source: own work: data drawn from SCOPUS database

Bibliographic data of journals consisted of journal titles, duration status of publication, Scimago rankings, and citation statistics which were all derived from the Scopus database. This information allowed us to perform time series analysis and to enable the identification of the most important and relevant scientific journals. Following bibliometric analysis the 30 most cited articles were selected for qualitative content analysis in order to create a thorough overview of the most influential portions of the corpus. As a prime selection criterion we excluded some outliers based on content of abstracts. Qualitative text analysis of shortlisted papers focused on (1) the

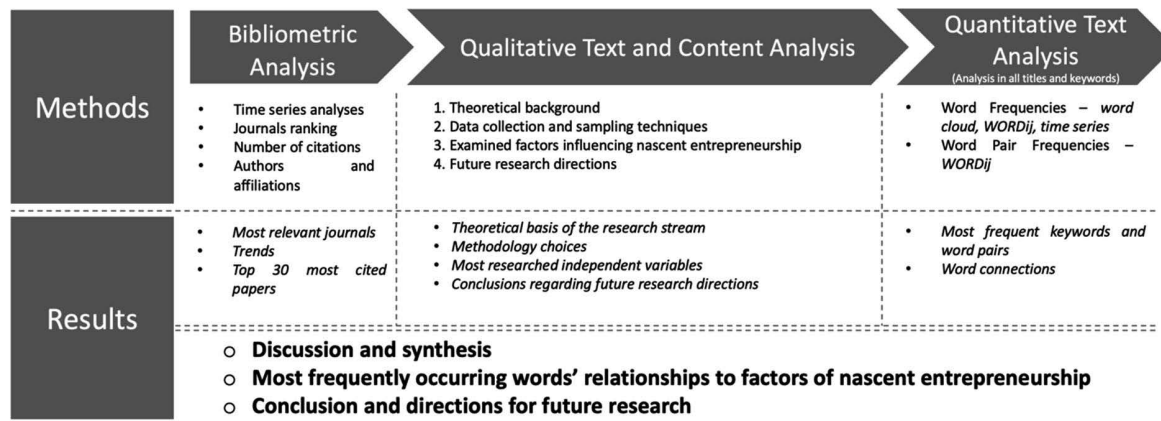
analysis the original search terms, conjunctions, research-related terms and their conjugated forms were filtered out from the results in order to focus on words and phrases that carry new and relevant information. Finally, synthesis of qualitative and quantitative findings was presented.

Results of the systematic literature review

In this section we introduce and examine the literature corpus of 20 years of extant research on nascent entrepreneurship through the lens of different bibliometric and text analysis tools. Through this process we finally

Figure 2

Methods and focal points of qualitative and quantitative analysis



Source: own work

theoretical background, (2) the methodological approach, (3) factors included in the analysis and (4) further research suggestions presented in the articles (see Figure 2).

Following systematic analysis of bibliometric and qualitative results, quantitative content analysis of titles, keywords and abstracts was deployed to gain a broader overview of the most common themes in the entire corpus. Word and word pair frequency analysis were supported by WORDij software (Danowski, 2013). In the process of text

were able to formulate a synthesis driven model of factors affecting nascent entrepreneurship.

Bibliometric analysis

It can be concluded from time series analysis of the article database that interest in nascent entrepreneurship increased gradually and significantly between 2000-2020. Figure 3 indicates that relatively few studies on the subject matter appeared in the early 2000s. The term and concept of

nascent entrepreneurship became more prevalent starting from 2003, with all four published papers selected for qualitative analysis from that year focusing on underlying factors of entrepreneurial intentions. Since then, the topic attained increasing frequency of publication with local peaks in paper frequency noted in 2006 and 2012. It can also be observed that a relatively high number of published papers has stabilized and gradually increased since 2018, attaining its highest point to date in 2020 with 27 papers.

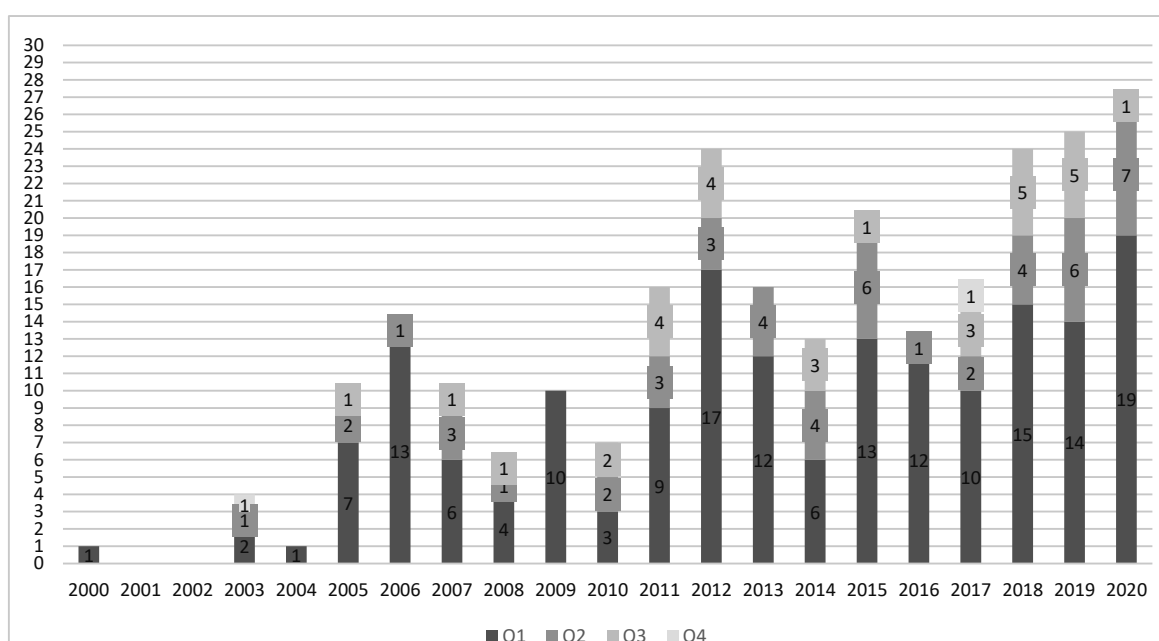
This trend offers convincing evidence of increasing scientific interest in the topic and indirect indication of sharp growth in accumulated knowledge with regard to nascent entrepreneurs. An increase in the number of published papers is usually accompanied by an increase in specialization which also became apparent in the course of text analysis.

We also located compelling indicators with regard to scientific quality. For this purpose we examined the Scimago Journals Ranking (SJR) of journals publishing research on nascent entrepreneurship. Most articles in the corpus were published in high-ranking journals: 64% of articles were published in Q1, 23% in Q2, and up to 13% in lower-ranked journals. These data again indicate relevance of the topic, quality of the empirical data collected to date and also support the argument that studying nascent entrepreneurship is accepted and encouraged at the highest level in the scientific field of entrepreneurship.

We compiled a list of the top 10 journals based on the number of published articles. Table 1 illustrates the list of journals publishing the majority and thereby comprising more than 50 per cent of nascent entrepreneurship research articles in our database. The list includes eight Q1 journals,

Figure 3

Number of articles published between 2000-2020 in relation to Scimago Journal Ranking Status



Source: own work: data drawn from www.scimago.com

Table 1

Summary of the top 10 journals based on the number of published papers

Nr.	Source Title	SJR Ranking	Number of papers	Number of citations to these papers	Average citation per paper
1.	Small Business Economics	Q1	41	4629	113
2.	Entrepreneurship and Regional Development	Q1	13	1070	82
3.	Journal of Developmental Entrepreneurship	Q3	12	81	7
4.	International Journal of Entrepreneurial Behaviour and Research	Q1	11	201	18
5.	Journal of Business Venturing	Q1	11	3709	337
6.	Journal of Business Venturing Insights	Q1	11	105	10
7.	Journal of Small Business Management	Q1	11	360	33
8.	International Entrepreneurship and Management Journal	Q1	10	311	31
9.	International Journal of Entrepreneurship and Small Business	Q2	9	107	12
10.	Entrepreneurship: Theory and Practice	Q1	7	148	21

Source: own work: data drawn from Scopus database

with one journal each in the Q2 and Q3 categories. This suggests very promising prospects for future researchers of the subject matter regarding availability of high-quality demand and publishing outlets. Based on article and citation frequency statistics *Small Business Economics* is the most prominent journal in the field, with more articles and citations than other journals on our list worthy of close attention of future researchers. Based on the profile of journals we expected papers to be relatively diverse in terms of economic approach or level of analysis. Based on the calculated average citation per paper the *Journal of Business Venturing* seems to be strongly impactful. The impressive 337 citation per article statistics is probably a major result of the early influential article by Davidsson and Honig (2003) entitled “*The role of social and human capital among nascent entrepreneurs*” which was cited 2134 times.

Qualitative content analysis of the most influential articles

The 30 most cited papers were selected for in-depth qualitative content analysis to explore the most influential nascent entrepreneurship research themes as presented in Table 2. More than 75 per cent of the articles were published before 2010, which might be partly explained by not enough time having then elapsed for papers published in the preceding 10 years to generate a higher number of citations. Furthermore, articles placed in the first third of the list are referred to as “classic” or “basic work” in theoretical reviews and as such they constantly continue to generate citations.

The process of qualitative text analysis covered four characteristics of each study: (1) theoretical background, (2) data gathering and analytical methods, (3) key variables considered in the research models influencing

Table 2

List of the 30 most cited articles selected for qualitative analysis

Nr.	Authors	Title	Year	Data source	Nr.	Authors	Title	Year	Data source
1	Davidsson P., Honig B.	The role of social and human capital among nascent entrepreneurs	2003	PSED	16	De Clercq D., Arenius P.	The role of knowledge in business start-up activity	2006	GEM
2	Arenius P., Minniti M.	Perceptual variables and nascent entrepreneurship	2005	GEM	17	Lichtenstein B.B., et al.	Measuring emergence in the dynamics of new venture creation	2006	Primary (own) data
3	Wennekers S., et al.	Nascent entrepreneurship and the level of economic development	2005	GEM	18	Hechavarria D.M., Reynolds P.D.	Cultural norms & business start-ups: The impact of national values on opportunity and necessity entrepreneurs	2009	GEM
4	Carter N.M., et al.	The career reasons of nascent entrepreneurs	2003	PSED	19	Edelman L.F., et al.	Entrepreneurship education: Correspondence between practices of nascent entrepreneurs and textbook prescriptions for success	2008	Textbooks and PSED
5	Delmar F. and Davidsson P.	Where do they come from? prevalence and characteristics of nascent entrepreneurs	2000	Other secondary data	20	Parker S.C.	Intrapreneurship or entrepreneurship?	2011	PSED
6	Van Stel A., et al.	The effect of business regulations on nascent and young business entrepreneurship	2007	GEM	21	Mueller P.	Entrepreneurship in the region: Breeding ground for nascent entrepreneurs?	2006	SOEP (German socio-economic panel)
7	Kim P.H., et al.	Access (not) denied: The impact of financial, human, and cultural capital on entrepreneurial entry in the United States	2006	PSED	22	Rotefoss B. and Kolvereid L.	Aspiring, nascent and fledging entrepreneurs: An investigation of the business start-up process	2005	Other secondary data
8	Dimov, D.	Nascent entrepreneurs and venture emergence: Opportunity confidence, human capital, and early planning	2010	PSED	23	Edelman L.F., et al.	Start-up motivations and growth intentions of minority nascent entrepreneurs	2010	PSED
9	Minniti M. and Nardone C.	Being in someone else's shoes: The role of gender in nascent entrepreneurship	2007	GEM	24	Krabel S. and Mueller P.	What drives scientists to start their own company? An empirical investigation of Max Planck Society scientists	2009	Other secondary data
10	Caliendo M., et al.	Risk attitudes of nascent entrepreneurs- new evidence from an experimentally validated survey	2009	SOEP (German socio-economic panel)	25	Cassar G.	Are individuals entering self-employment overly optimistic? an empirical test of plans and projections on nascent entrepreneur expectations	2010	PSED
11	Reynolds P.D., et al.	The prevalence of nascent entrepreneurs in the United States: Evidence from the Panel Study of Entrepreneurial Dynamics	2004	PSED	26	Van Gelderen M., et al.	Success and risk factors in the pre-startup phase	2005	PSED
12	Cassar G.	Money, money, money? A longitudinal investigation of entrepreneur career reasons, growth preferences, and achieved growth	2007	PSED	27	Davidsson P. and Gordon S.R.	Panel studies of new venture creation: A methods-focused review and suggestions for future research	2012	PSED
13	Lichtenstein B.B., et al.	Complexity dynamics of nascent entrepreneurship	2007	PSED	28	Parker S.C. and Belghitar Y.	What happens to nascent entrepreneurs? An econometric analysis of the PSED	2006	PSED
14	Liao J. and Welsch H.	Social capital and entrepreneurial growth aspiration: A comparison of technology- and non-technology-based nascent entrepreneurs	2003	PSED	29	Renko M.	Early challenges of nascent social entrepreneurs	2013	PSED
15	Davidsson P.	Nascent entrepreneurship: Empirical studies and developments	2006	Literature review	30	Stuetzer M., et al.	Regional characteristics, opportunity perception, and entrepreneurial activities	2014	GEM

Source: own work

entrepreneurial intention and related results and (4) future research directions. While all these aspects might help guide future research, the key variables analysed by these influential papers also enabled us to draft a general framework of nascent entrepreneurial intent.

Theoretical models

No single theoretical model attempting to comprehensively explain nascent entrepreneurship has specifically emerged to this point to conceivably serve as a seminal and consensual basis for future research. In most of the examined articles, authors tend to focus only on one or more aspects of the subject matter and to accordingly explore extant literature. For example, in the case of human and social capital studies the theoretical groundwork provided by Davidsson and Honig (2003) serves as a prominent basis for further studies. Moreover, Stuetzer et al. (2014) also presented a theoretical model based on work by Lazear (2005) to describe entrepreneurial human capital as a balanced skillset. Apart from this study, general social and behavioral models (i.e. Edelman et al., 2010; Lichtenstein et al., 2006; Lichtenstein et al., 2007) were located. In particular a conceptual model connecting the phenomena of nascent entrepreneurs' opportunity confidence grounded in experience and venture emergence (Dimov, 2010) was identified. We believe that with development of the research field a unified model or general framework to overview factors influencing nascent entrepreneurship might be beneficial as a means of creating a common language between researchers and as a basis for international comparability. As an initial developmental step in this regard, a synthesis driven model of factor categories is presented in next section (see also Figure 4).

Data collection and sampling techniques

Examination of summaries of data collection and sampling techniques indicates that 90 per cent (27 papers) of located studies use secondary data sources. Prominently, results of the Panel Study of Entrepreneurial Dynamics (PSED, 16 papers) and the Global Entrepreneurship Monitor (GEM, 7 papers) research tool serve as an empirical basis for the most cited papers. The use of these and other country-specific datasets are not surprising, as they provide researchers with large, comprehensive, and comparable databases and present significant resource and cost-efficient possibilities. While many PSED or GEM based papers were not selected for the corpus (i.e. Reynolds, 2007), such relatively large panel studies already dominate content of the most influential papers. As indicated in Table 4 'panel study' forms the 6th most frequent word pair in keywords of the entire corpus. In overall terms just one of the 30 papers relied on primary data collection in the form of a case study. Another single paper presented a literature review thereby suggesting that use of qualitative or other innovative forms of empirical research might be enhanced as field research tools.

Factors underlying nascent entrepreneurship

In general terms, intrinsic motivational factors are dominant in this regard, thereby addressing the issue of why some individuals wish to become entrepreneurs. Studies have also been conducted of facilitating factors and resources required for an individual to become an entrepreneur. However such studies only emerged in a few cases in the course of our review. Based on analysis of the 30 most cited papers, we could identify four general categories of influential underlying factors in human capital, socio-demographic characteristics, the social environment and financial capital respectively.

Human capital

Human capital widely seen as skills, capabilities, knowledge and experience possessed by individuals, can be the source of both opportunity and innovation, and instigate an individual's intention to achieve something novel or unique (Parker, 2011). Several studies emphasize that while time spent in formal education has a positive effect on individuals becoming nascent entrepreneurs (i.e. Muller, 2006), knowledge and skills acquired as such are not necessary to start a business. Social background, ambition, and perseverance may substitute formal education (Davidsson & Honig, 2003; Kim et al., 2006). Moreover, work experience may complement skills and knowledge acquired through formal education and may enable employees to gain experience in the areas necessary if deciding to run their own businesses and to be sufficiently motivated to adopt an entrepreneurial lifestyle (Kim et al., 2006). Previous leadership experience can be a particularly valuable factor in terms of enabling individuals to adequately assess barriers and opportunities inherent in entrepreneurship (Dimov, 2010). Hence individuals possessing managerial experience are expected to be more likely to be nascent entrepreneurs than individuals not possessing it (Dimov, 2010). However, some studies have indicated that past self-employment and other leadership experience can not only be encouraging, but that related negative experience can also discourage nascent entrepreneurship (i.e. Davidsson & Honig, 2003).

Such underlying factors may reinforce other intrinsic motivational traits for nascent entrepreneurship. For example, an individual may desire recognition, and self-realization (Muller, 2006; Szerb & Lukovszki, 2013; Van Gelderen et al., 2005) in relation to the usefulness of his or her work (Westhead et al., 2005). Independence is also an important motivational factor described as an individual's desire for freedom and control (Kim et al., 2006).

Socio-demographic characteristics

Many researchers agree that the decision to start a business is complex and is greatly influenced by a wide range of socio-demographic characteristics determining specific circumstances of entrepreneurially inclined individuals (i.e. Caliendo et al., 2009; Minniti & Nardone, 2007; Muller, 2006). Variables such as age, gender, education, employment status, income, geographical location, marital status, household size are typically the

most frequent factors considered. All such factors have demonstrated a capacity to systematically influence entrepreneurial decisions regardless of environmental circumstances (Muller, 2006). In some studies, these and other similar factors are included as control variables, but in the vast majority of the papers in our review they appear as independent variables.

Studies of gender-based differences in nascent entrepreneurship have focused on examination of factors such as income, geographic location, marital status and family size (i.e. Minniti & Nardone, 2007). Some studies have indicated that such conditions alone do not explain gender differences in nascent enterprises (i.e. Carter et al., 2003). Further exploration is necessary to identify the roots and mechanisms of how gender may influence nascent entrepreneurial intent and success.

Social environment

Social capital is typically defined as the sum of the resources that individuals acquire from their relationships with others (i.e. Muller, 2006; Gubik & Farkas, 2016). In general, the social environment can facilitate access to valuable resources for new entrepreneurs and can be useful in terms of acquiring feedback or new information. However support from the wider environment is also central to the development of entrepreneurial motivation and the realization of an actual enterprise (Muller, 2006).

Several studies conclude that entrepreneurial activities are often concentrated geographically. Generally a strong concentration of entrepreneurs in given localities will generate stronger levels of new enterprise creation over time (Caliendo et al., 2009). In particular, specific studies indicate that individuals possessing a personal relationship with other self-employed persons or family entrepreneurs are more likely to start a business (i.e. Imreh-Tóth et al., 2013; Lückgen et al., 2006; Wagner, 2005; Wagner & Sternberg, 2004). If an individual's close friends, spouse, or partner are self-employed, their presence may serve as a valuable social environment for nascent entrepreneurs (i.e. Arenius & Minniti, 2005; Hechavarria & Reynolds, 2009). Moreover, employees who start a business can benefit from business networks they previously gained access to (Rotefoss & Kolvereid, 2005).

In a more general context, several new or young businesses in an individual's close circle of friends or acquaintances may also have a strong incentivizing effect in that person becoming a nascent entrepreneur (Wagner & Sternberg, 2004). Intrinsic motivation may consciously or subconsciously increase by gaining knowledge from others in the entrepreneurial environment (i.e. Lückgen et al., 2006; Wagner, 2005; Wagner & Sternberg, 2004). Furthermore, the need for recognition of entrepreneurial intention from family, friends and acquaintances can be an important motivating factor in starting a business (Kerékgyártó, 2021; Muller, 2006; Wagner & Sternberg, 2004). In some cases, an individual's desire to follow family traditions or imitate the example of others can also be an important source of entrepreneurial motivation rooted in the social environment (Liao & Welsch, 2003).

Financial capital

A nascent entrepreneur generally intends to earn more income than being otherwise employed and to achieve financial security (Muller, 2006). This aspect serves as an essential factor influencing entrepreneurial intent (Davidsson & Honig, 2003). In some societies when individuals become prime income earners in families and aspire to higher income levels they are more likely to choose entrepreneurship instead of salaried employment (Kim et al., 2006). However in societies such as the USA and Germany, a desire to attain higher income levels is not positively correlated with nascent entrepreneurship as individuals tend to have more confidence in fixed salaried incomes than the uncertain prospects of starting and running a new business (Delmar & Davidsson, 2000).

Outcomes of entrepreneurship research generally suggests that availability of financial capital has a major impact on the development of new ventures (i.e. Cooper et al., 1994; Kim et al., 2006). Initial capital requirements depend on the type of business in that some industries do not typically require high capital levels thus rendering them easier to access but it can be observed that new entrepreneurs also expect financial benefits sooner (i.e. Cassar, 2010). Based on our review we assume that personal wealth can facilitate transition to entrepreneurship, as individuals with high levels of personal or family wealth do not typically have a strong need for external financing (Edelman et al., 2010). However, wealthy individuals are more likely to act more as angel investors and are less likely to start a business themselves (Kim et al., 2006). In the same study it was found that neither household wealth nor household income increased the likelihood of becoming a nascent entrepreneur.

Recommendations and future research directions

One of the most frequent recommendations appearing in the papers is that of performing regular updates on studies in order to observe nascent entrepreneurs in a longitudinal manner over time (i.e. Davidsson, 2006). Popular secondary data sources derived from international surveys such as PSED and GEM might also provide some longitudinal data to facilitate in depth research (Szerb & Petheő, 2014). In accordance with a generally accepted definition of nascent entrepreneurship, a business is considered to be "new" in its first six years (i.e., Brush, 1995; Jáki et al., 2019; Shrader et al., 2000), thereby implying that it would be appropriate to follow progress of survey participants for six years (Davidsson, 2006). Alternately, based on our textual analysis, in 33 of the papers the word 'longitudinal' was located in titles, keywords or abstracts. Nonetheless, with time this research gap seems to be diminishing.

Another recurring, although not necessarily new (Westhead & Wright, 1998) research recommendation is to examine the entrepreneurial motivation of serial founders, and of entrepreneurs who have previously founded a new business (i.e. Arenius & Minniti, 2005; Davidsson, 2006). Exploration of intent and methods of entrepreneurship (Kassai, 2020) might provide richer datasets for pattern analysis as well as instructive insights for other groups of entrepreneurs.

The third popular topic recommended by several papers focuses on gender-related differences. Numerous articles have been written on female and male entrepreneurs (Davidsson, 2006; Minniti & Nardone, 2007). However, it has not been possible to clearly identify variables explaining gender differences in nascent entrepreneurship thus underlining the necessity of further in-depth studies.

Quantitative text analysis to explore overall trends and themes

As the next step of the systematic analysis process, the whole corpus was explored by using word and word

pair statistics to identify patterns and most frequently occurring themes. In order to attain a more in-depth picture we also analysed word frequencies over different time periods (2000-2005, 2006-2010, 2011-2015, 2016-2020). This process also included analysis of the text of abstracts (see Table 3).

Some of the most frequently occurring words (Table 3) and word pairs (Table 4) refer to general concepts related to entrepreneurship, notably, “business”, “startup”, “venture”, “creation”, “new venture”, “venture creation”, “business startup”, and “new business” thereby embedding the literature stream in the wider context of new business

Table 3

Time series word frequency

2000-2005		2006-2010		2011-2015		2016-2020	
n=16		n=47		n=89		n=105	
Word	Frequency	Word	Frequency	Word	Frequency	Word	Frequency
business	33	business	73	business	115	business	114
process	25	process	47	social	104	new	114
startup	24	startup	46	new	84	social	104
new	18	venture	43	startup	63	venture	94
economic	15	capital	37	venture	61	startup	79
capital	13	opportunity	35	capital	58	capital	57
development	13	activities	26	process	53	intention	56
social	12	social	25	gender	37	learning	46
venture	12	success	23	human	34	ventures	46
growth	10	individuals	22	learning	29	process	43
activities	10	financial	21	network	29	competencies	42
individuals	9	firm	21	development	29	opportunity	41
activity	8	human	19	growth	27	purpose	41
characteristics	8	growth	19	role	27	relationship	40
gestation	8	activity	19	factors	27	human	39
efforts	8	experience	18	selfefficacy	26	role	39
group	8	learning	16	planning	26	model	39
start	8	education	15	activities	25	innovation	37
success	7	planning	13	ventures	24	gender	36
be	7	start	13	resources	23	resource	35
ventures	7	groups	12	motivation	22	activities	34
firms	7	organizational	11	success	22	selfefficacy	34
countries	6	knowledge	11	intentions	22	knowledge	33
startups	6	environment	11	support	22	experience	33
role	5	women	11	education	21	education	33
human	5	future	11	financial	21	family	32
nontechnologybased	5	risk	10	experience	21	beliefs	32
factors	5	factors	10	women	20	cultural	32
relationship	5	decision	10	activity	20	development	30
individual	5	opportunities	10	individual	19	individuals	30
population	5	ethnic	10	impact	19	identity	29
environmental	5	economic	10	international	19	university	29
resources	5	efforts	10	firms	18	competition	28
university	5	internal	10	small	18	factors	28
aspiration	4	gender	9	identity	18	women	28
technology	4	attitudes	9	skills	17	intentions	27
canadian	4	career	9	economy	17	performance	27
gender	4	white	9	risk	17	risk	26
policy	4	cognitive	9	strategies	17	management	26
nonentrepreneurs	4	resources	9	students	17	strategic	25
launch	4	individual	9	enterprises	17	nonprofit	25
purpose	4	teams	9				

Source of data: own work

creation research. Less frequently occurring words and word pairs such as “intentions”, “process” or “success” refer to different approaches and aspects of the focus of studies. In general word frequencies correctly reveal the three most important angles of analysis: namely exploring the factors behind entrepreneurial intentions, analysing the process leading to venture creation and attempting to identify key success factors.

The term “social” appears most frequently in titles as well as in keywords probably as the result of two independent effects. Firstly, social capital is one of the often-examined factors or factor categories of entrepreneurial intention and success (i.e. Davidsson & Honig, 2003). Moreover, some studies pay special attention to “nascent social entrepreneurs” as individuals who set up businesses primarily to achieve social goals rather than to generate personal financial gain (i.e. Dees, 1998; Mair & Martí, 2006; Wei-Skillern et al., 2007; Loarne-Lemaire, 2017). Increasing interest in social entrepreneurship (i.e. Tan et al., 2021) is also confirmed by the frequency of the word “non-profit” in 25 articles between 2016 and 2020. It is clear from word pair frequency statistics (see Table 4) that while social entrepreneurship is gaining scientific traction in line with its economic importance (Carter et al., 2003; Davidsson, 2006; Edelman et al., 2008), the terms “social capital”, “social support” and “social skills” possess more significant presence in the literature to this point. This finding is in line with our presented systematization synopsis based on qualitative analysis. Social capital is one of the four key factor categories most heavily researched in the field of nascent entrepreneurship.

The term “capital” also frequently appears throughout the timescale of the surveyed investigation as the 5th-6th most frequently occurring term in each 5-year period. This trend is also influenced by many other factors. “Human capital” and “social capital” both appear in the list of the top 5 most frequently occurring word pairs with concepts placed at the centre of scientific attention, as already observed from qualitative analysis. Here it is also notable that the 1,5 times higher word pair frequency for “human capital” than other terms suggests the concept seems to be more widely discussed. Nonetheless capital in general could also refer to financial resources needed for starting a new venture. As there are only two articles in the corpus focusing on venture capital and five on financial capital, we conclude that financing needs exist more on the perimeters of the nascent entrepreneurship research field.

Our statistics indicates that terms related to inclusion and diversity such as “gender”, “women”, and “ethnic” also appeared frequently in all time periods (see also Laudano et al., 2018). This would suggest that nascent entrepreneurship studies focusing on female entrepreneurs most frequently occurring between 2011 and 2015 and different ethnicities with a peak in the 2006-2010 period (i.e. Tamasy, 2010) were constantly part of the discourse. However interest in both topics has recently subsided as interest in closely related scientific debates seem to be markedly declining.

Relatively high frequency of the term “growth” occurring in our list is not surprising given the development and growth of businesses is an important research topic. However, the term has reduced in frequency in the most recent 5-year cycle (2016-2020), while others gained

Table 4

15 most frequent word pairs in keywords and titles

15 most frequent word pairs in keywords					15 most frequent word pairs in titles				
	Number of pairs	Number of unique pairs	Average pair frequency	Pair entropy		Number of pairs	Number of unique pairs	Average pair frequency	Pair entropy
	1852	321	5.769470	5.418262		2285	349	6.547278	5.479105
Word Pair	Frequency	Proportion	Entropy Term	MI*	Word Pair	Frequency	Proportion	Entropy Term	MI*
new venture	22.000000	0.011879	0.052660	3.472135	human capital	14.000000	0.006127	0.031217	4.708690
venture creation	22.000000	0.011879	0.052660	3.964612	social capital	9.000000	0.003939	0.021808	3.499602
human capital	20.000000	0.010799	0.048902	3.824850	new venture	8.000000	0.003501	0.019798	3.718291
new creation	14.000000	0.007559	0.036927	3.592669	business startup	7.000000	0.003063	0.017732	3.270645
social capital	12.000000	0.006479	0.032651	2.460534	venture creation	6.000000	0.002626	0.015604	3.990225
panel study	9.000000	0.004860	0.025886	4.594289	business plan	4.000000	0.001751	0.011112	4.054764
study dynamics	9.000000	0.004860	0.025886	4.594289	new creation	4.000000	0.001751	0.011112	3.535970
global monitor	9.000000	0.004860	0.025886	5.325588	study dynamics	4.000000	0.001751	0.011112	3.543938
business startup	7.000000	0.003780	0.021084	2.075214	new business	3.000000	0.001313	0.008712	2.514319
startup process	7.000000	0.003780	0.021084	2.721841	organizational emergence	3.000000	0.001313	0.008712	5.599663
business planning	6.000000	0.003240	0.018571	3.602822	social identity	3.000000	0.001313	0.008712	3.499602
business development	6.000000	0.003240	0.018571	2.791891	social skills	3.000000	0.001313	0.008712	3.836074
social support	6.000000	0.003240	0.018571	3.821511	startup activities	3.000000	0.001313	0.008712	3.696312
new ventures	6.000000	0.003240	0.018571	3.639189	growth intentions	3.000000	0.001313	0.008712	3.894915
creation process	6.000000	0.003240	0.018571	3.237848	mediating role	3.000000	0.001313	0.008712	4.346900

*it means Mutual Information: The mutual information column indicates the amount of information according to the extent to which a given word pair contributes to the content of the corpus. This value would reach its maximum if the words in the vocabulary were fully associated (Aji-Kaimal, 2012, p. 49.)

Source of data: own work

traction. This aspect might possibly reflect a general shift from growth economics to sustainability. One of the new words appearing on the list is that of “family” as the 26th most frequent word compiled between 2016-2020. Family support for entrepreneurs as outlined by Manolova et al. (2019) and family-based new ventures as outlined by Muñoz-Bullón et al. (2019) have also become emergent topics of interests.

Some frequent terms such as “knowledge”, “self-efficacy” or “culture” focus on human aspects of entrepreneurship while others such as “management”, “economy” or “performance” suggest a more managerial standpoint. In the former category “education”, “learning” and “university” maintain stable positions at the top of periodical frequency lists thereby suggesting that the role of formal education in becoming an entrepreneur has been continuously investigated (i.e. Blenker et al., 2013). In the latter category of managerial terms, it is interesting to highlight the strong occurrence from 2010 of “strategy”, which reflects renewed disciplinary orientation of the research agenda. Another shift of focus is notable in the emergence of the term “business planning”. This would imply that some studies have already proceeded beyond the stage of developing entrepreneurial intention and focus on other influencing factors in actually starting a business.

Discussion and synthesis

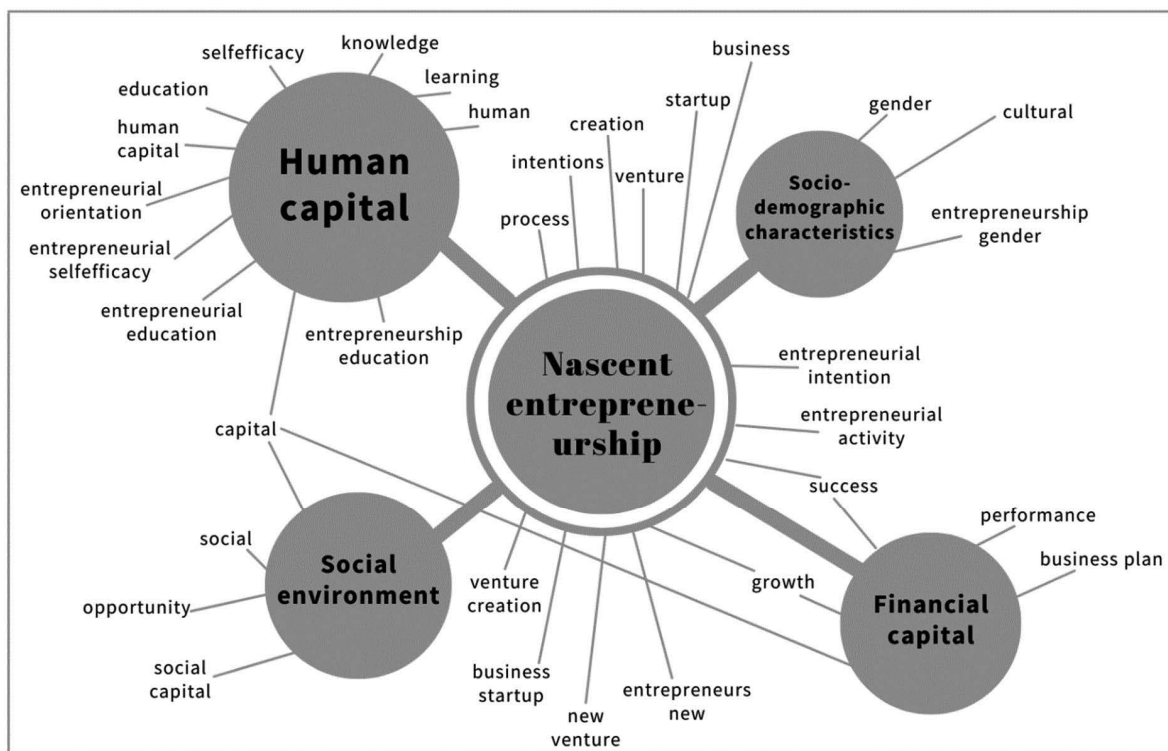
The two most prominent questions posed from examination of 20 years of nascent entrepreneurship literature revolved around factors influencing entrepreneurial intentions and

those affecting entrepreneurial performance. By comparing these two research streams it is notable that research on entrepreneurial intention is much more diverse. This seems to be in line with our original expectation given our focus on the specific context of nascent entrepreneurship especially in terms of entrepreneurial intent rather than actual business creation.

Based on the systematic literature review we could identify four categories of factors in human capital, socio-demographic characteristics, the social environment and financial capital as all possessing a notional influence on nascent entrepreneurial intent. In order to synthesize our results Figure 4 illustrates the four categories based on qualitative text analysis as outlined in a previous chapter, thereby connecting them to the most frequent words and word pairs of the quantitative text analysis outlined in this chapter. The relative size of the circles representing the four factors in the figure reflects the frequency of the related phrases. Factors representing human capital and the social environment were repeatedly prominent in both the qualitative and quantitative text analysis phases, with many keywords and phrases reflecting the factors. The other two factors of socio-demographic characteristics and financial capital feature less prominently with fewer related words and word pairs used in the texts. In this regard it would seem that research scholars followed tighter research agendas and also used more focused language. Ultimately, the model presented in Figure 4 could serve as a starting point to examine factors of nascent entrepreneurship in a more systematic manner.

Figure 4

Most frequently occurring words’ in relation to nascent entrepreneurship factors



Source: own work

Conclusion and implications for future research

We believe it is important to take stock of the status quo from time to time in order to decide how to progress further. Our systematic review of 20 years of nascent entrepreneurship research based on objective qualitative and quantitative methods provides a fresh overview of past trends and provides pointers to promising future research directions.

Our results indicate that nascent entrepreneurship has aroused growing scientific interest in recent decades, with most of the articles appearing in prestigious business and entrepreneurship journals representative of high quality standards. The most prominent nascent entrepreneurship authors seems to be geographically concentrated in the USA, Canada, Australia and Western Europe thus leaving ample room for exploring the topic in less developed economies.

With little or no agreement on a dominant, all-encompassing model for nascent entrepreneurship, most of the studies are focused on one or more factors of entrepreneurial intention. Our key contribution lies in presentation of systematisation of these factors and our analysis reveals four categories of factors influencing nascent entrepreneurship in human capital, the social environment, socio-demographic characteristics and financial capital.

Human and social capital as factors influencing entrepreneurial intent and subsequent success are at the forefront of research interest with some of the most cited articles such as that of Davidsson & Honig (2003) serving as fundamental seminal texts in the field. With regard human capital the role of education and experience is extensively researched, while most cited papers dealing with the social environment tend to focus on the influential role of the presence of other entrepreneurs in family or social circles.

The entire field has been characterised by a high level of social sensitivity, with many studies focusing on ethnic and gender diversity, and increasingly: on social entrepreneurship. Our analysis revealed research streams examining other specific types of nascent entrepreneurs. Specific focus on family-based new ventures and serial entrepreneurs could be important future research directions in particular.

Future research recommendations also entail the refinement of data collection and methodological approaches. Many researchers still tend to rely on the use of macro-oriented databases such as PSED and GEM. In order to achieve robust and representative results more effectively a movement towards greater use of longitudinal and qualitative studies could reveal more information on the nascent entrepreneurial process.

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DIGITAL DYNAMIC VISUAL IDENTITIES – PROSPECTS AT THE FRONTIERS OF MARKETING AND DESIGN

DIGITÁLIS DINAMIKUS VIZUÁLIS IDENTITÁSOK – KILÁTÁSOK A MARKETING ÉS A DIZÁJN HATÁRAIN

A logo is worth more than a thousand words. But how much are thousands of logos worth? Contemporary visual communication toolkit of companies and brands is becoming more and more technology-driven and extended by Dynamic Visual Identity (DVI) systems. Algorithmic, data-based, interactive DVIs promise unprecedented opportunities to brands and pose new challenges for designers and marketers. This paper explores the characteristics of generative type digital dynamic visual identities with the aim of stimulating interdisciplinary discourse and scientific examination at this frontier of marketing and design. The current study applied qualitative inquiry to a curated sample of contemporary visual systems designed after 2013. By using content analysis and the designcommunication (DIS:CO) approach the authors identified three dimensions that are suitable for the examination, and development of DVI cases regardless of the industry, technology and media used. Explanations are illustrated by the award-winning DVIs of world-renowned agencies such as Pentagram, Saffron, and Lava.

Keywords: dynamic visual identity, designcommunication, digitalisation, branding, design

Egy logó többet ér ezer szónál. De mennyit ér több ezer logó? A vállalatok és márkák kortárs vizuális kommunikációs eszköztárára egyre inkább technológiavezérelt és dinamikus vizuális identitás (DVI) rendszerekkel bővül. Az algoritmusos, adatalapú, interaktív DVI-k soha nem látott lehetőségeket ígérnek a márkáknak, és új kihívások elé állítják a tervezőket és a marketingeseket. Ez a cikk a generatív típusú digitális dinamikus vizuális identitások jellemzőit tárja fel azzal a céllal, hogy ösztönözze az interdiszciplináris diskurzust és tudományos vizsgálatot a marketing és a tervezés e határterületén. A jelenlegi tanulmány kvalitatív vizsgálatot alkalmazott a 2013 után tervezett kortárs vizuális rendszerek egy kiválasztott mintáján. A tartalomelemzés és a designkommunikációs (DIS:CO) megközelítés segítségével három olyan dimenziót azonosítottak a szerzők, amely iparágtól, technológiától és médiától függetlenül alkalmas a DVI-esetek vizsgálatára, fejlesztésére. A magyarázatokat világhírű ügynökségek, például a Pentagram, a Saffron és a Lava díjnyertes DVI-jei illusztrálják.

Kulcsszavak: dinamikus vizuális identitás, designkommunikáció, digitalizáció, márkáépítés, design

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Author/Szerző:

Balázs Fekete¹ (education@balazsfekete.com, balazs.fekete2@uni-corvinus.hu) PhD candidate

¹Corvinus University of Budapest (Budapesti Corvinus Egyetem) Hungary (Magyarország)

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The widespread digitalisation of economic sectors goes hand in hand with the changing of the role of economic organisations in our lives. Corporate communications are developed according to rules that are shaped by a changing society and changing market conditions (Szalay, 2018). As these changes seem to be accelerating, certain turbulence can be felt in the

relations between companies and consumers, and their typical communications. Digital consumption habits transformed by online platforms are offering the stakeholders of brands experiences and participation opportunities that are more interactive and intense than ever before. The continuously evolving toolkit of organisational and product brands utilising up-

to-date communication technologies is used to invent new ways of impressing audiences. The latest technological developments increase the potential of visual communication and design (Lélis et al., 2020, p. 3). In addition to social and technological conditions, factors that are in constant flux such as the market and the competition, the target group, and changes in trends and applications should also be considered in the development of visual communication (Lorenz, 2022 p. 40). By utilising the concept of Dynamic Visual Identities (DVI) managers and creators become able to act in response to all these factors. With the help of a DVI, innovative brands may communicate with each of their stakeholders through unique visuals created with generative and data-driven customised looks, and via reactive interfaces capable of interaction. Such utilisation of generativity changes the design process and the role of designers (Gross et al., 2018) and brand owners as well. In such cases, ever-changing visual identities emerge in place of static visual identities built using consistent elements only. The mantra of the past, that the visual identity should be consistent, is now in metamorphosis (Papp-Váry, 2020). This may be named the post-logo era (Guida, 2014), since the logo, the simple graphic symbol used for identification, is being replaced by more complex and sophisticated visual systems.

It is an important factor that the range of options offered by business communication tools is in continuous evolution due to emerging state-of-the-art communications technologies, which is also reflected in the changes in consumer behaviour. A central element of postmodern consumption is the notion that the ideal “post-consumer” not only takes steps to be surrounded by goods but is also actively involved in the processes of constructing those goods (Mitev & Horváth, 2008). Co-creation even appears as a new, substantial consumer expectation (Kenesei & Kolos, 2018). A contemporary brand can cater to this demand through a carefully crafted DVI.

The emergence of DVIs calls for substantial reconceptualisation and further explorations both in the management and design practices of business communication. In this study, we seek answers to the following question: „*What dimensions can be explored in the qualitative characteristics of generative type digital dynamic visual identities?*”, through qualitative content analysis and designcommunication (DIS:CO) (Cosovan, 2009; Cosovan & Horváth, 2016; Cosovan et al., 2018) research.

The investigation aims to stimulate an interdisciplinary discourse on digital dynamic visual identities by connecting the fields of marketing and visual design. It is hoped that this study can uncover dimensions that can be utilised in the current research and practice of both fields, and that induce forward-looking questions concerning digital business communication, brand building, and company image development.

Theoretical background

Dynamic Visual Identities

The emergence of DVIs is a relatively new phenomenon in the history of visual communication. Even before the turn of the Millennium, there have been examples of forward-looking brands and unconventional designers putting significant emphasis on expressing variability and versatility in the form of visual identity. MTV Music Television had utilised the concept as early as 1981, and subsequently, it became more widely known with the appearance of Google Doodles. The phenomenon became popular in the 2010s when metropolises (e.g. Melbourne, NYC), as well as cultural and educational institutes (e.g. OCAD University), began to utilise it in their communication (Van Nes, 2012). In recent years, the use of new, digitally operated DVIs has been more and more prevalent. Globally known organisations, services, and products using DVIs are also appearing. Examples of these are the visual identity of the LA28 – the summer Olympic games of 2028 (URL1), which received broad media coverage, or the 2020 infographics-based visual system of the popular Eurovision Song Contest (URL2), which received the highly esteemed Red Dot Design Award of 2020.

The theory of DVIs is also connected to the literature on marketing through the domains of Corporate Visual Identity (CVI) (van den Bosch et al., 2006), Corporate Design (Melewar & Karaosmanoglu, 2006), and Visual Brand Identity (Phillips et al., 2014), since DVIs can be applied in many ways to support brands’ design. While design-oriented businesses consider design as an element that is central to their operation, non-design-oriented companies also recognise it as a factor in competitiveness (Szalczar, 2008). A common element in various brand theories is that brands identify, differentiate, and can create a unique and lasting effect on consumers, and thus need to be managed as well (Bauer, 1995, p. 40). For companies, the development of modern visual identities through DVIs could be an excellent vehicle for this.

In the following paragraphs, we will approach this subject from the perspective of corporate visual identity. According to the definition of the British Standards Institute (Balmer, 2008, p. 899), a CVI is the “*Visual expression of an organisation’s corporate identity: the face it puts on itself, its activities and outputs*”. Melewar and Jenkins (2002) defines Communication and visual identity as a subconstruct of Corporate Identity. In a later paper, we find that Visual Identity is linked to Corporate Structure (which consists of Brand structure and Organisational structure) (Melewar & Karaosmanoglu, 2006). These authors define visual identity as a factor that affects Corporate Communication. Studies like Melewar and Saunders (1999) and Sharma and Jain (2011) also define Corporate Visual Identity as an important element of Corporate Communications. Brooks et al. (2005) argue that Corporate Identity is a versatile phenomenon where visual elements are of critical importance. They play a role

in differentiation, the shaping of reputation and image, and in getting the public to remember the company. A Corporate Visual Identity can be understood as the external symbol of the company's internal efforts (Shee & Abratt, 1989). It is a tool that can be used to create, maintain and enhance competitive advantage if developed appropriately.

Corporate Visual Identity is a set of symbols that the organisation mainly uses to identify itself (Dowling, 1994). Extending this argument, it can be said that CVIs are utilised for two main purposes: to capture corporate culture and to promote its communication efforts (Balmer, 1995). Furthermore, it can also facilitate the better identification of employees with the company (Van den Bosch et al., 2006). Thus, the CVI is the amalgamation of tangible and functional elements that express the identity of the company: the combination of name, logo (or symbol), colours, tagline, language, and text (Aaker, 1996; Kapferer, 2008).

The recent visual turn (Gregersen, 2020) has transformed the field of visual communications. Contrary to the traditional approach, consistent visual systems and identification integrated into invariant narratives are being replaced by a dynamic, interpretative quality. Parallel to this phenomenon, a conceptualisation that frames identity formation as a dynamic, multi-actor process is increasingly prevalent beside theories that define corporate and organisational identity as static – as the literature review of Balmer (2008) also reveals. The engagement of stakeholders may also be related to a central emphasis on enhancing customer experience, which can yield better profitability and higher perceived customer value for companies (Kenesei & Sepródi, 2017, p. 53).

Our study focuses on unconventional, postmodern (Kreutz, 2005) visual communication systems that create a plural, heterogeneous, non-consistent appearance for the represented organisation or brand. In these cases, following the rules established during the design phase, one or more of the components get modified based on a

factor that is considered an independent variable (Van Nes, 2012; Parente et al., 2019).

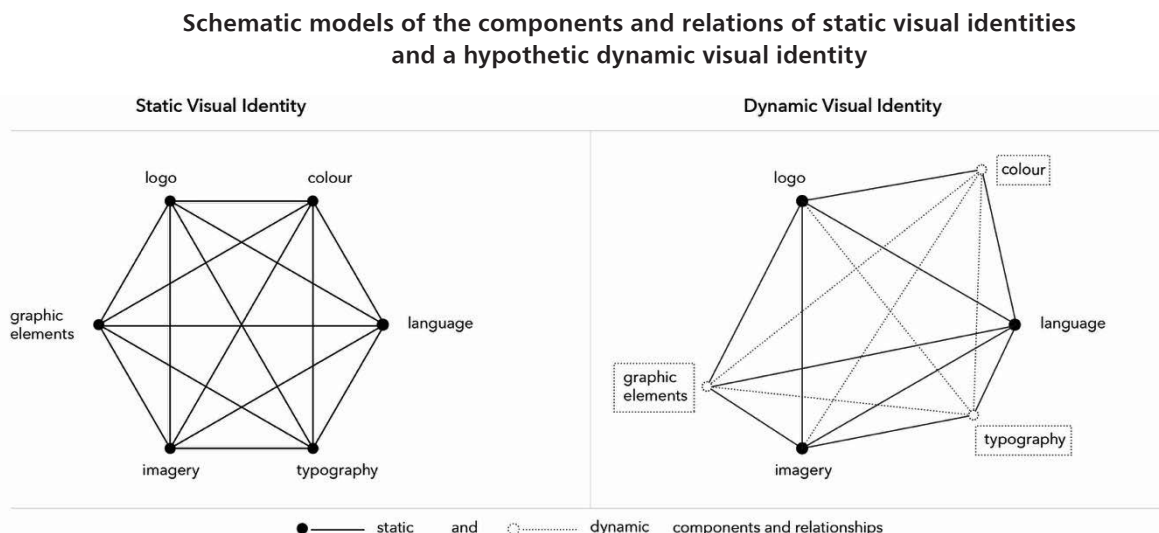
As it can be seen below (Figure 1), contrary to static visual identities, both dynamic and static components and relations may be integrated into DVIs. It is the responsibility of the brand management and designer to decide whether dynamism is present and, if so, to what extent.

A momentous characteristic of DVIs is the fact that they can adapt to new conditions since the metamorphosis has been coded into their operation. They are not only modifiable but could also be called live, or in other words, active (Felsing, 2009; Van Nes, 2012; Lelis, 2019).

The latest publications on the subject (Lelis, 2019; Parente et al., 2019) examine the mechanisms utilised in DVIs and explore their visual attributes. Another branch of study investigates the operation of DVIs and the technological aspect of their creation (Martins et al., 2018; Parente et al., 2018; Rebelo et al., 2018; Pereira et al., 2019).

The comprehensive literature review and taxonomy of Martins et al. (2019) intend to bring together the efforts made in the DVI literature and summarise the diverse world of DVIs in a single model. The authors recommend that DVIs be analysed through the examination of (i) identity focus, (ii) variation mechanisms, and (iii) features. In terms of identity focus, two types are distinguished: graphic mark and visual system focused DVIs. This feature shows the part of the DVI where dynamism primarily appears. Is it present in the graphic mark that identifies the entity or if it is more present within the visual language? A variation mechanism can be any procedure that is experienced visually: changes in colour, the combination of graphical elements, content variations, positioning, repetitions, changes in size, changes in shape. As for functions, features that are not visual characteristics of DVIs can be mentioned: flexibility, fluidity, generativity, informativity, interactivity, and reactivity. These functions portray the operating characteristics of the DVI systems.

Figure 1.



Source: edited by the author based on Van Nes (2012, p.7)

Digital and Generative DVI

A DVI system can be considered digital if a digital component or procedure is an integral part of its creative concept. The subject unit of our study is the digital and simultaneously generative DVI.

The definition proposed by Martins et al. (2019, p. 2) can serve as a basis: „the variations of the DVI are generated by an algorithm. The designer develops an algorithm that generates one or more elements of the VI system [...] Designing by coding allows the designer to create custom tools that lead to new kinds of imagery and highly customised designs”. We suggest that the category be named *generative* rather than *generated* since it better expresses the active nature of these kinds of DVIs. According to the (Merriam-Webster, 2022) dictionary, the term *generative* refers to „having the power or function of generating, originating”. The term is derived from Latin and can be interpreted as „producer” or „creator” (Zaicz, 2006), it clearly reflects the principles of operation in such visual systems.

One of the early DVIs, created through an algorithmic procedure, was the visual identity of the Hannover EXPO 2000 (URL3) where dynamism appears in the visual system through a digital procedure. As the logo is the central element of visual identity (Papp-Váry & Gyémánt, 2009), it is no surprise that this element was the first one where dynamism appeared in the early generative DVIs. One of the earliest documented instances of generative DVIs that operated in real-time and could be considered

live was the logo (URL4 of the Rhizome website published in 2001, where a system capable of generating a potentially infinite variety of logos using the IP addresses of website visitors was created.

Thanks to the technological innovations utilised, info-communication has become one of the most highly researched areas within innovation research (Keszey & Zsukk, 2017), thus, it can be said that it is a field that is at the forefront of using new technological solutions. The research of phenomena related to digitalisation in marketing will likely become even more relevant due to the growing weight of the usage of artificial intelligence, Big Data-based marketing, the utilisation of machine learning procedures, and the data collection and market research methods offered by social media.

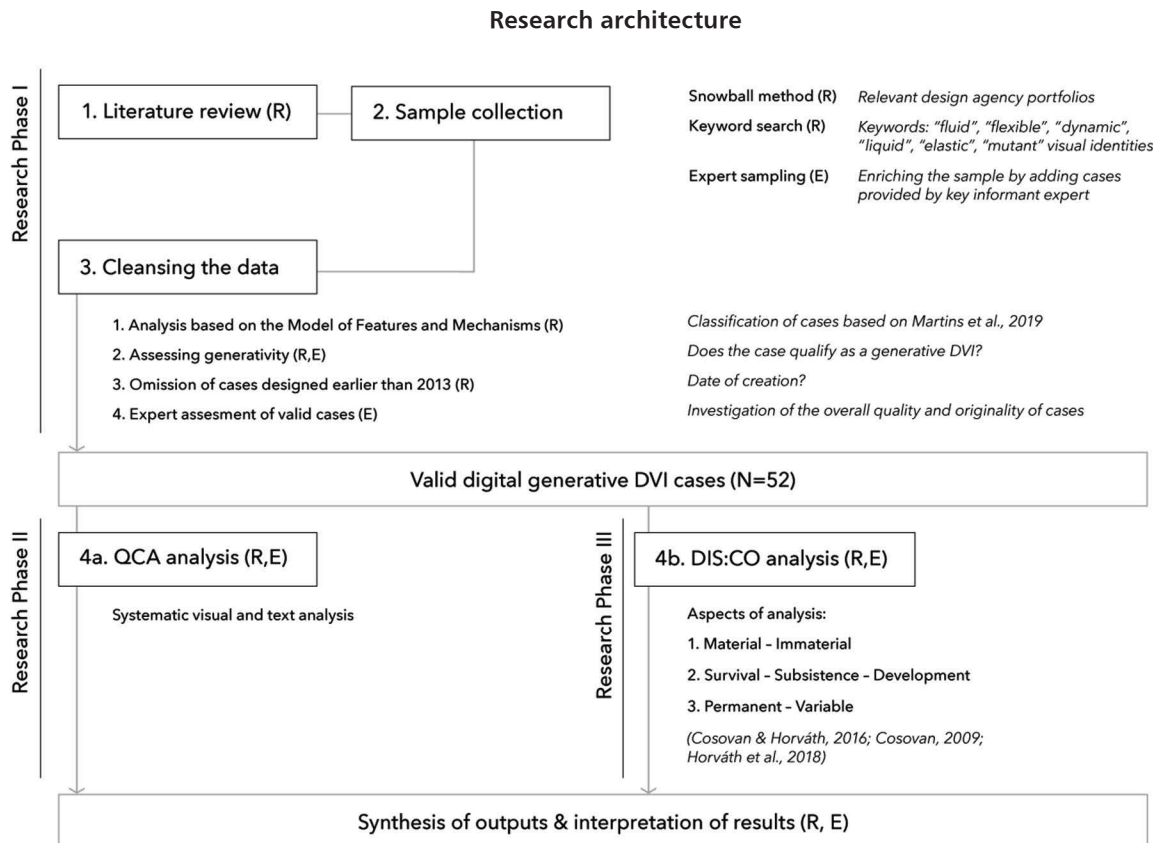
Methodology

Research goals

A central element of the expected theoretical contribution is for the findings to create further potential openings in research on the subject, and to provide starting points for interdisciplinary discourse, and theorisation.

An important objective of the investigation is to cover a significant research gap, thus, newer DVIs designed after 2013 are explored. Since this period can be considered insufficiently researched even in international publications, this characteristic may be considered an important novelty.

Figure 2.



Source: edited by the author

In light of all the above, the central question of the study is the following: „*What dimensions can be explored in the qualitative characteristics of generative type digital dynamic visual identities?*”

Due to the nature of the research question, the use of a qualitative research design was deemed most appropriate. To promote discovery and exploration, sample units have been collected, filtered, and systematically analysed through two qualitative analytical procedures (Figure 2). After the data had been produced, the Features and Mechanisms model of Martins et al. (2019) was utilised for data cleansing. Our findings have been produced through the synthesis of the conclusions of qualitative content analysis and DIS:CO analysis carried out on the sample derived in the above-mentioned way. Thus, this study can be classified as a hybrid study as it combines more than one qualitative method in a parallel manner (Neulinger, 2016).

A master's degree graduate designer expert with international study and work experience has also participated in the production, cleansing, and analysis of the data. Thus, the triangulation of data collection methods, analytical procedures, and researchers all promote research quality and the reliability of results.

I. Research Phase: Data Collection and Classification

Since the utilisation of DVIs is widespread globally, a large number of cases have not been compiled into one collection, and besides, new cases appear on a regular basis. Thus, the snowball data collection technique was considered the most appropriate for producing the sample. Its basis was the cases presented in previous publications and the portfolios of well-known designer studios. This was complemented by detailed keyword research with the following terms from the relevant literature: *fluid, flexible, dynamic, liquid, elastic, mutant, and dynamic visual identity*. The third data collection method was expert sampling.

Three criteria functioned as filters for sample units: 1. If examined through the analytical framework of Martins et al. (2019), the given case can be conceptualised as a DVI, 2. it fits the definition of generative as a characteristic, 3. the year of creation should be later than 2013.

In this time-intensive phase, excluding visual identities that did not qualify as DVIs was important. These, although they may appear to include variation mechanisms that DVIs also operate by, do not carry dynamism, change, and variability at the core of their creative concept. After determining the identity focus and analysing the variation mechanisms, features were analysed. This is a more difficult task since these characteristics cannot necessarily be perceived through visual examination only. Here, we could rely primarily on textual data such as descriptions and case studies published by designers and owners. If a functioning DVI was available, experimenting with and testing it was also helpful. We continued the research with cases that fit the definition of generativity laid down earlier. After expert opinions were established and more

than a hundred cases were filtered out, the case number was determined as N=52.

II. Research Phase: Qualitative Content Analysis

Each sample unit consists of the visual presentation of the given DVI case and its complementary description texts, and extended case studies published by their designer or owner, which creates the opportunity for both visual and textual qualitative analyses. In the case of such richer data sources, the method of content analysis can be utilised successfully, which can reveal further layers of meaning (Bell, 2001). After the analysis, conclusions can be drawn regarding the context and the message of the content as well (White & Marsh, 2006). The identification and coding of available themes and patterns are subjective but provide the opportunity for creating scientific interpretations (Zhang & Wildemuth, 2009). During the research, the various layers of both the written and the visual content were systematically analysed and the findings were synthesised and summarised. With the help of this inductive procedure, we have been able to get an insight into both the direct and the latent layers hidden in our rich data. The goal of this exploratory investigation was not the quantifiable analysis and descriptive characterization of the sample, but the identification of DVI characteristics that are useful for the outlining of the dimensions sought in our research question. During the coding and interpretation of the results, a consensually approved intersection of the findings of the author and of the external expert has been accepted, excluding any extreme or ambiguous cases.

III. Research Phase: Qualitative DIS:CO Analysis

To increase the reliability of the findings, a second analytical procedure has also been utilised. As the subject matter is tightly connected both to design and marketing communication, designcommunication (that is: DIS:CO) was a straightforward choice. This widely applicable approach and method is an intentional collision between the scientific fields of design and business communication (Cosovan, 2009; Cosovan & Horváth, 2016; Cosovan et al., 2018; Galla, 2021; Horváth & Horváth, 2021). It „*uses a designer's toolkit to help its users integrate human needs, technological opportunities and the criteria of business success into the development of strategies, organisations, and products.*” (Cosovan et al., 2018, p. 233).

The application of this methodology and approach in the development of creative products make it possible to cater to a more holistically framed set of human (beyond consumer) needs in a humanistic way. It is a set of approaches and tools that can be valuable even beyond development work. It can enrich us with perspectives through which building connections with our audience can, according to the standards of DIS:CO (Cosovan, 2015; Cosovan & Horváth, 2016; Galla, 2021), be considered objectively and subjectively good for the whole of the social context.

The projects represent a high level of professionalism that apply the guidelines and principles of the DIS:CO approach in creative development recognised

internationally, as evidenced by several international awards. Besides the success of the Red Dot Design Award-winning DSI Salt Inhaler, Teqball, Coco Dice and Nosiboo products designed by Attila Róbert Cosovan and CO&CO Designcommunication, other substantial recognitions of DIS:CO include the German Design Award, the Hungarian Design Award, the Ferenczy Noémi Award, Millennium Award, and the Finewaters Taste and Design Competition.

Beyond the practical application of DIS:CO, the method is also utilised in different scientific fields within the research programs of the Corvinus University of Budapest. This piece of innovative Hungarian know-how is a contemporary alternative (Cosovan et al., 2018) and competitor to design thinking, while also complementing it: it supports solving challenges that Dorst (2011) specifies as open-ended. This act demands divergent thinking instead of a convergent closed problem-solving strategy. And this is how it becomes a valuable element of a multi-perspective qualitative research toolkit. As it is originally rooted in design practice, it is very well suited for the analysis of creative products, artworks, and design artefacts as well.

The cornerstones presented below allow for an abductive analysis of the content, which is carried out during the reflexive thematic analysis. We are using this approach to complement the inductive analysis utilised in the second phase of the research, and thus, it may offer new insights. As Peirce (1934) suggests: „[Abduction is] the only logical mechanism that introduces new ideas into a scientific body of knowledge” (Timmermans & Tavory, 2012, p. 170). The analytical method presented below can be labeled as pragmatic, since “the empirical “reality” was created by the researchers involved in the observation” as Mitev (2012, p. 20) suggests. In our case, this pragmatism is also rooted in the history of the method, its approach is practical, its principles include: „design = doing good” (Cosovan, 2009; Cosovan & Horváth, 2016). DIS:CO, originally developed to design creative products, has become a holistic paradigm in design theory, and it also excels in the promotion of scientific understanding and social innovation as the application of the method by Galla (2021) underpins it.

According to its definition, the term designcommunication means communication integrated into development (Cosovan, 2009), generated by the designers’ ability to establish connections. This integration of communication into design can also be induced and analysed subsequently, with the help of the following interrelationships: investigation of 1. Material – Immaterial qualities, the assessment of how 2. Survival – Subsistence – Development aspects emerge in the phenomenon and examination of 3. Permanent – Variable elements (Cosovan & Horváth, 2016; Cosovan, 2009; Horváth et al., 2018). The designers’ and creators’ optimum can be found through these holistic interrelationships (Cosovan, 2017), and we can also use these interrelationships to discover how the latent qualities of the examined data can be interpreted and transformed in a meaningful way for research in the field of design and marketing as well. In

this phase of our research, we analysed the cases along these three guidelines, to discover new perspectives through a divergent thinking strategy.

Findings

The research question of our study is the following: „What dimensions can be explored in the qualitative characteristics of generative type digital dynamic visual identities?”

The themes and patterns identified through a visual and textual qualitative analysis of the DVI cases collected and identified during the first phase of research, and the attributes recognised through a DIS:CO analysis, have revealed a total of six dimensions of larger thematic units. Three of these have proven dominant both in phases II and III of the research.

Based on the synthesis of the findings of the research methods, we have identified the following dimensions (Table 1) as domains that are suitable for the characterisation of operational principles and the attributes of DVIs.

Table 1.
The three analytical dimensions of the attributes of digital dynamic visual identities

DIMENSIONS	POLES
Origin of Independent Variable	External — Internal
Operational Autonomy	Autonomous — Heteronomous
Extent of Control	Low — High

Source: author’s own editing based on the research findings

All demonstrated dimensions can be described as: 1. they may characterise any domain of the components and relational systems in between them (see: Figure 1) of the DVI, 2. their presence is independent of the technologies and media used, although certain industry patterns can be observed, it can be stated that 3. they are suitable for the assessment of DVIs regardless of sector. The poles should be understood not as categories but as a continuous spectrum.

The interpretation and illustration of the dimensions, presented within the limits of this publication and through typical examples describing the poles, can be found below.

Origin of Independent Variable Dimension

As the definition of DVIs reflects, one of their characteristics is that the change that takes place within the visual system is not ad hoc but adapts to the state of an independent factor as a result of purposeful design. Digital generative DVI systems have an input side that drives them as well as an output side that manifests through variation mechanisms. The input factor is the independent variable that is an influential component of the system, whereas, as the poles of the referring dimension indicate,

its origin may be decisive for the nature of DVI. One of the poles of this dimension can be associated with cases where this variable is external, where it can be defined by the market or the social and physical environment. In such cases, the creative concept utilises an item of knowledge mutually held by and with stakeholders, or a factor that is closely related to the brand. This can make understanding easier for the audience, although in most cases they cannot influence the course of its change. In the case of internal variables, however, change can be steered directly, internally. This creates the opportunity for shared value creation together with the stakeholders. Through the utilisation of a DVI specialised for the expression of internal characteristics, the independent variable remains closely linkable to the represented entity, their relationship is not just poetic or associative.

Advocating for the use of solar energy, the energy sector brand Powen (URL5) employs malleable graphic emotions in its logo. The colours of these elements are inspired by the changing palette of light throughout the day, referring to the varying nature of energy. In this case, the referenced periodically renewing variable, although closely connected to the entity's operation, is *external*. This visual identity received the German Design Award 2020 for excellence in communications design.

In the case of the 20th Nördik Impakt Festival (URL6), the independent variable input of the DVI system is more internal from the brand's point of view. Those interested in the event can directly customise the experimental poster of the festival to their own musical and visual taste through an online application (URL7).

The Operational Autonomy Dimension

As these are programmed visual systems, the theme of automation was also present in the DVIs we examined. Based on the patterns we have uncovered, a distinction can be made between concepts that operate independently and as a closed unit after designing, and open systems that require interventions. One pattern observed during the investigation is that operational autonomy is linked to the nature of the touchpoints utilised by the represented entity. The basis for heteronomous operation is typically created through interactive platforms that enable real-time two-way communication, as in this way, users can get direct feedback about the outcomes of their actions that influence the visual identity.

The logo of Sonantic (URL8), designed by Pentagram, comes to life through animated form, in real-time. The sophisticated waving motion of the letter "O" sensitively symbolises the fine vibrations of the human-like sounds produced by the startup, synthesised by artificial intelligence. The visual system does not need to be controlled by humans, it operates *autonomously* after designing, without any further interventions. The DVI can generate innumerable logo variations, at virtually no additional cost.

A good example of DVIs with a *heteronomous* operation is present in the Hungarian Design Award 2014 winning concept of the visual identity of Lamantin Jazz Festival

(URL9), which takes advantage of both interactivity and reactivity. In the case of this Hungarian-designed DVI, the typography is – authentically – influenced by musical sounds. The system has an interface (URL10) where visitors can interact with the logo: they can drive it with their own voice or with music. In summary, due to its heteronomous quality, the DVI requires human contribution for its visuals to be activated. This attribute can serve as an excellent catalyst of engagement, as it is able to create an experience through the anticipated elaboration. A heteronomous DVI can also be a cost-efficient solution, as customisation does not require the users to have extraordinary graphics or technical knowledge after it had been designed. The managers of the represented brand can also deliver numerous communication materials. As an example, the Schwanensee (URL11) DVI provides the project owners with an application that enables them to create unlimited design variations for promotional materials for their events effortlessly from a web browser.

The Extent of Control Dimension

The theme of control emerged as an immaterial factor during the DIS:CO analysis and as latent content during the analysis. The poles of the *extent of control* dimension – which may also be understood as the dimension of power – focus on the extent to which the owner can maintain control over the outcomes of the DVI throughout its operation. Waiver of control may evoke the possibility of risks in the reader, however, the cases investigated entailed a positive phenomenon instead: constructive cooperative actions between the stakeholders engaged, through the extension of responsibility. What we observed in the case of Nördik Impakt (URL6) confirms this: „*The generative design set up on the website has enabled the public to create more than 11,000 artworks, used to print flyers, posters and merchandise.*”

Waiver of control may at the same time also be interpreted as an expression of a consumer-oriented approach. In the case of such approaches, consumer empowerment is facilitated, that is, this range of stakeholders enter an area of corporate operation (Gálik, 2018) within a preset framework, and they shape it actively. By handing over authority, the brand owner expresses their trust in a group or phenomenon that is important to them. This can also be interpreted as a symbolic act through which the brand, by opening control over the outcomes, also makes an indirect reference to its own approach to power. With a lower level of control, a DVI provides an opportunity not only for the expression of identity but also for shaping it. This is in accordance with the branch of literature that focuses on the induction of stakeholders' identification, presented by Balmer (2008) – it can be understood as a manifestation of it.

The DVI (URL12) was designed for the „Go with the flow” campaign of DIESEL generated audio-reactive animations projected at campaign venues using the pictures uploaded to the social media platforms by the target audience. The brand, by partially relinquishing the

control over visual communication, opened the possibility for real-time visual dialogue between participants and the brand. As participants are free to contribute in unregulated ways, this system can be described with a *low* level of control.

A DVI system can also operate under a high level of control. In the dynamic logo of Spektr (URL13), fragments of the cinematographic products created by the media production company can be seen. The ever-changing content appearing in fixed letter forms presents the creative products created by the company directly, albeit in its fractions. It is an example of container-type DVI according to the classification of Van Nes (2012). In this example, although the presentation remains varied, it provides a *high* level of control to the owner.

Other Findings

The various phases of the research have also yielded unexpected findings that provide theoretical contributions and useful practical considerations for the research and designing of such special visual identities.

The first consequential recognition was made during the collection and classification of DVIs. Through the application of the Features and Variation Mechanisms analytical framework, 17 visual identities were deemed appropriate for further analysis. These utilised several variation mechanisms and thus could lead to a false identification as DVIs. In several cases, identities were misclassified as dynamic visual identities by the designers or brand owners themselves. This phenomenon reflects the fragmented nature of the literature on the subject and the lack of agreement on the naming conventions. The visual identities were eliminated due to the above reasons during the expert data cleansing process and the textual analysis typically used colour variation, combination, or content variation mechanisms in their visual language. These cases predominantly entailed umbrella brands, organisations operating with several subdivisions, or brands communicating by motion graphics. Therefore, we suggest visual analysis alone is not sufficient for the identification of DVIs, richer data sources need to be analysed, so that it can be determined whether dynamism is a crucial element of the creative concept that serves as the core of the visual system. It must be determined whether the designer's creative strategy is rooted in change and variability in a truly meaningful way, or if this attribute is only *l'art pour l'art*.

Another important finding is that, based on our analysis, generative type digital DVIs can indeed be considered a contemporary manifestation of postmodern marketing as well. In the cases examined, the factors of construction, openness, and adaptability were all present. These are all related to the patterns of plurality and diversity, which can be jointly considered postmodern characteristics according to Mitev and Horváth (2008). All of this is supporting the argument of Kreutz (2005): since DVIs, embedded into a contemporary social history context, fulfill postmodern expectations.

Conclusion & Implications

It has become apparent through our investigation that not only media change, but the role of visual identities is also in the midst of a transformation in the digital age: beyond the primary function of identification, further layers of connections are also created, which may encompass various types of brand-audience relations. Through the customizability and versatility of DVIs the possibilities for fostering engaging user experience are also increasingly in focus.

The examples presented in this study demonstrate that the data and information that drive visual communication can be derived from consumers both directly and indirectly. As a result, they can become an integral part of customer value creation and customer experience design. Enterprise information systems that manage customer information and user data can be integrated with digital generative systems that are applied in visual communication. DVIs can even go beyond the mere utilisation of input data by extracting additional information from stakeholders and engaging them through interaction and reactivity. With the help of easy personalisation, mass customisation can also take a fully automated form.

By opening the dogmatic consistency of visual appearance and allowing external stakeholders and factors to modify it, a higher level of engagement can be achieved, which can help enhance customer experience. As pointed out by Kenesei and Sepródi (2017), customer experience is formed through encountering various touchpoints and based on comprehensive impressions. Since DVIs have a significant influence on the quality of brands' touchpoints, they can be considered particularly well suited for influencing the customer experience. In certain cases, the visual identity can be understood as a service in itself (e.g., Lamantin Jazz Festival, Nödik Impakt), the visual system helps to fulfill a need for self-realisation by simultaneously meeting the communication needs of the represented company.

The most significant theoretical implication is that the findings indicate the heterogenous versatility of generative dynamic visual identities, thus, the theoretical exploration of the subject can be further enriched through research (that differentiates DVIs on the basis of the presented dimensions) of the visual communication systems that fit within the domain defined by the three dimensions uncovered in the study. It is also illustrated by the examples, that the fields of design and marketing are connected to the DVI phenomenon in several ways. The findings presented may serve as a basis for interdisciplinary scientific value accumulation. The explored dimensions support the fundamentals of this, as they help us describe and differentiate between generative DVIs, not only based on their materially present visual layout or functions that are central to the aspect of design, but also from a marketing perspective – based on their stakeholder focused internal characteristics.

Specific practical recommendations can also be provided along with these developments. Special designer

know-how and toolkit are essential for the successful utilisation of DVIs, accompanied by the preparedness of the project owner with clear business, marketing, and communication goals. The creative strategy utilised in a given project can be flexibly adapted to the brand personality, financial resources of the represented entity, as well as to the consumer and market expectations it needs to meet.

Through the *internal* independent variable, the brand can express its original internal characteristics, and its unique, authentic features (the essence of the brand). Data derived through marketing activities supported by information systems can also be used for the development of data-driven visual communication. The utilisation of an *external* variable can help capture elements of reality whose variation is recognised by the target audience, and thus, this shared knowledge can promote the understanding of the DVI.

Autonomously operating systems typically do not require further resources or the intervention of the designer after designing, thus, their utilisation may also be similar to that of static visual identities, but with the added benefits that come with variability. The operation of *heteronomous* systems requires more effort from stakeholders which can take the form of either financial or psychological costs. If a brand wishes to address and engage its audience through the DVI, these factors need to be considered by the management. The heteronomous operation can come with high returns as well: the tools of co-creation can enhance consumer experience; however, care needs to be taken in these cases for the DVI to be utilised within a holistic approach.

The utilisation of a DVI offering *low control* can be an ideal solution if this suits the character, personality, promise, and message of the represented entity. In this case, although the owner seemingly foregoes control, this may be a rewarding strategy as it may yield constructive contributions from the stakeholders involved in control. DVIs with an optimally *high level of control* can also be designed for brands that wish to unconstrained events that they perceive as risks. The benefits of DVIs can be taken advantage of even in these cases, and even brands with this approach can keep up with the competition driven by increasing digitalisation.

Future Research and Limitations

Due to the explorative nature of the research and the relatively uncharted state of the subject matter, significant effort has been invested in the exploration of potential research directions as well. Besides the body of knowledge, the research constitutes, another aspect of scientific value can be found in the research gaps it uncovers – what else needs to be explored and what questions are truly relevant for the subject of DVIs? In the following paragraphs, the gaps identified through the research and the opportunities offered by any limitations will be presented in detail.

There are three major fields in this study that could be addressed in future research. First, the study

revealed the latent dimensions that characterise the creative strategy. However, the different specific creative strategies were not explicitly investigated in the study. Thus, the empirical results reported that in the case of the DVIs investigated, the static and dynamic nature of the visual elements carries certain meanings. However, potential narratives could not be explored due to a lack of the necessary data. Uncovering the narratives and interpretations coded into DVIs could yield interesting and valuable results, but due to the specificities of the subject, these can only be explored with the help of the diverse segments of stakeholders.

The second limitation is a consequence of digital operation: a large number of unique outcome variations can be generated through generative DVIs. In many cases, a virtually infinite number of mutations can be created, as in the previously presented cases of Schwannensee, DIESEL, or Spektr, among others. In the case of these DVIs that generate numerous outcome variants, the following pattern emerged from the data: the creators or owners mentioned these DVIs as cost-efficient, sustainable assets that are expected to support that brand for a long time. These visual systems presumably do possess these attributes if these accounts are considered reliable sources of information. However, the collected sample was not suitable for the exploration of this matter, and as a result, the dimensions of time and cost were not included in the findings. The analysis of the life cycle of dynamic visual identities requires further data collection, longitudinal research, a case study approach, or possibly a comparative perspective.

The third potential for future study lies in the limitation that, the utilisation of technological innovations in marketing communication lags behind its potential, as Keszei (2007) has pointed out earlier as well. Concerning our subject matter, this phenomenon can be declared partially confirmed, as, during our research (and contrary to our preliminary assumptions), we have not yet seen the state-of-the-art information technology solutions that are widely used in other business fields. For example, there were no signs of using machine learning (ML), systems using artificial intelligence (AI), or the Internet of Things (IoT). As the pace of technological development seems to keep accelerating (Kurzweil, 2005) and as these innovations are becoming increasingly widespread in marketing practice, digital DVIs that use available technologies which have not been utilised here are expected to emerge in the near future, which would create the need for supplementing the findings of this study.

Summary

The three dimensions explored (*1. Origin of the independent variable, 2. Operational autonomy, 3. Extent of control*) and their respective poles can serve as pragmatic reference points for designers and brand owners and can be useful during brand development and the design of the visual communication system. It is an important finding that along these dimensions, clients, as well as their designers

can assess the competitive landscape and their own creative concepts within a shared framework.

This is no longer just the dawn of the post-logo era: we are already living in it. The acceleration of the pace of technological development is expected to bring about the further development of communication media as well. Designcommunication (DIS:CO) research and development methods can support those interested in providing an immersive brand experience, authentic and unique visuals in this digital age.

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Hyperlinks

- URL1: 2028 Olympics in Los Angeles DVI: <https://www.designweek.co.uk/issues/31-august-6-september-2020/2028-la-olympics-logo>
- URL2: Eurovision Song Contest 2020 data-driven DVI: <https://www.red-dot.org/project/eurovision-song-contest-2020-48596>
- URL3: EXPO 2000 – One of the first digital DVIs: http://www.qwer.de/html/projekte_expo.html
- URL4: Rhizome – An early generative DVI: <https://rhizome.org/editorial/2001/sep/05/the-worlds-first-generative-logo>
- URL5: Powen DVI <https://saffron-consultants.com/case-studies/powen>
- URL6: Nördik Impakt DVI <https://www.behance.net/gallery/107703989/Noerdik-Impakt-20>
- URL7: Nördik Impakt poster generator: <https://poster.nordik.org>
- URL8: Sonantic DVI <https://www.pentagram.com/work/sonantic/story>
- URL9: Lamantin DVI <https://www.behance.net/gallery/17195287/Lamantin-Identity>
- URL10: Lamantin logo generator <https://hiddencharacters.github.io/lamantin/#mic>
- URL11: Schwanensee DVI <https://www.patrik-huebner.com/work/schwanensee-a-dynamic-identity-driven-by-dance>
- URL12: Diesel DVI <https://www.patrik-huebner.com/work/diesel-go-with-the-flaw>
- URL13: Spektr DVI <https://lava.nl/projects/spektr>

APPLYING A HYBRID MCDM TECHNIQUE IN WAREHOUSE MANAGEMENT

A HIBRID MCDM-TECHNIKA ALKALMAZÁSA A RAKTÁRKEZELÉSBEN

The main goal of this study is to apply Multi-Criteria Decision Making (MCDM) in managing a warehouse. One of the elements that could impact organization performance is warehouse management. Surplus inventory imposes some additional costs on the organization, and inadequate inventory stops the operation of an organization. For managing and controlling warehouse inventories, the MCDM method is recommended in this study. The inventories are categorized based on multi-criteria instead of a single criterion in ABC. To specify the criteria's weight, Best-Worst Method is used, and to reach the final score of spare parts, the Analytical Hierarchy Process, and Technique for Order of Preference by Similarity to Ideal Solution is applied. Some strategies for managing and controlling organizations' warehouse is recommended.

Keywords: Warehouse Management, Best-Worst Method (BMW), Analytical Hierarchy Process (AHP), Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS), Multi-Criteria Decision Making (MCDM)

A tanulmány fő célja a Multi-Criteria Decision Making (MCDM) alkalmazásának bemutatása a raktárkezelésben. Az egyik olyan elem, amely hatással lehet a szervezet teljesítményére, a raktárkezelés. A felesleges készletek többletköltségeket róznak a szervezetre, a nem megfelelő készlet pedig leállítja a szervezet működését. Ebben a tanulmányban az MCDM-módszert javasolja a szerző a raktári készletek kezelésére és ellenőrzésére. A készletek kategorizálása több kritériumon alapszik, az egyetlen ABC-kritérium helyett. A kritériumok súlyozásának meghatározásához a legjobb-legrosszabb módszert, a pótalkatrészek végső számának eléréséhez pedig az analitikai hierarchia folyamatot és az egyszerűségtől az ideális megoldásig preferencia-sorrend technikáját alkalmazzák. A szervezetek raktárának kezeléséhez és ellenőrzéséhez néhány stratégiát javasol a szerző.

Kulcsszavak: raktárgazdálkodás, legjobb-legrosszabb módszer (BMW), analitikai hierarchia folyamat (AHP), preferencia szerinti sorrend az ideális megoldáshoz hasonlóság alapján (TOPSIS), több szempontú döntéshozatal (MCDM)

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Author/Szerző:

Iman Ajripour¹ (szvai@uni-miskolc.hu) PhD candidate

¹University of Miskolc (Miskolci Egyetem) Hungary (Magyarország)

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Inventory management is a procedure that impacts maintenance management and, as a result, productivity (Teixeira et al., 2017). One of the main aspects of manufacturing factories is accessibility to required spare parts. To increase the efficiency of machines and decrease the time of machines' failure, the necessary spare parts must always be available in the factory's warehouse (Kundrak et al., 2018). Spare parts inventory and machine downtime can be reduced with a systematic and scientific approach to spare parts management (Gajpal et al., 1994).

Controlling all of the warehouse items by strict ordering principles is not logical in terms of cost and time constraints. (Hadi-Vencheh & Mohamadghasemi, 2011).

Kaabi et al. (2018) stated that managers can control inventory-related expenditures and increase the company's competitiveness by categorizing inventory items according to their importance. To effectively oversee inventory items, managers need to classify them (Kheybari et al., 2019). According to Syntetos et al. (2009), categorization allows managers to focus on the most "important" items and makes the decision easier. So, one of the main challenges of

managers in managerial decision-making of manufacturing companies is determining the optimal inventory level of each spare part. In this study, I focus on the inventory management of the warehouse to find the optimal inventory for selected spare parts using multi-criteria.

The development of a multi-criteria classification tool assists companies in identifying key stock items, which is valuable information for managers, particularly asset and maintenance managers (Molenaers et al., 2012).

Appropriate classification of items would benefit operational aims, such as sensitive raw materials supporting, inventories' control, and managing final outputs to decrease inventory expenses to the lowest feasible level (Partovi & Anandarajan, 2002).

There have been some classification methods like HML (High, Medium, Low), ABC ("A" items are extremely important, "B" items are moderately important, "C" items are relatively unimportant), SDE (Scarce, Difficult, Easy), XYZ ("X" items are least variation in demand, "Y" items are strong variable in demand, "Z" items are highly variable in demand), FSN (Fast moving, Slow-moving, Non-moving), and VDE (Vital, Desirable, Essential) to control and manage a warehouse. One of the most common methods for categorizing spare parts in a warehouse is ABC. This method has been used in different fields of study such as health (Han et al., 2020), automobile industry (Gong et al., 2020), medicine (Chinda et al., 2018), risk factor assessment (Vujovi et al., 2017), agro-industry (Ly & Rawewan, 2016), manufacturing industry (Balaji & Kumar, 2014), and hospital (Reid, 1987).

ABC is a traditional method for inventory categorization. This method classifies spare parts concerning the annual consumption rate (monetary value) (Hatefi et al., 2014; Ye et al., 2008; Cohen & Ernst, 1988).

ABC follows Pareto's 80–20 principles. Group A includes 10% of items that accounts for approximately 80% monetary value, group B contains 20% of items that costs almost 10% monetary value, and group C includes 70% of items that go for nearly 10% monetary value (Cui et al., 2021). It means a high monetary value is allocated to a small percentage of items. The items should be precisely managed (Reid, 1987). Partovi & Burton (1993) explained that the ABC might not be suitable and precise for some inventories categorization like spare parts.

Roda et al. (2012), Ramanathan (2006), Duchessi et al. (1988), Partovi & Burton (1993) believe, that to classify inventory items several criteria like lead time, cost of lacking parts, sensitivity, price, consumption rate, order size requirement, shockability, stock-out penalty cost, failure rate, sensitivity, shortages of items, etc. are important, but ABC only considers one criterion "monetary value of annual consumption". So, multiple-criteria categorization is required for accurate strategic inventory management and practical inventory classification (Zowid et al., 2019; Balaji & Kumar, 2014).

Molenaers et al. (2012) explained that if a manufacturing factory tends to classify spare parts based

on different criteria in its warehouse, employing MCDM (Multi-Criteria Decision Making) could be an appropriate solution. AHP (Analytical Hierarchy Process), TOPSIS (Technique for Order of Preference by Similarity to Ideal Solution), ELECTRE (ELimination Et Choix Traduisant la REalité), BWM (Best-Worst Method), etc. are some of the MCDM techniques that can be applied in the categorization of spare parts.

In my study, a new hybrid method (BWM-AHP-TOPSIS) is suggested to categorize items in a company's warehouse. Applying BWM, which is the main part of the novelty of the suggested method, could be an easy and practical solution to obtain the weights of criteria in the inventory management problems. Using the hybrid MCDM technique will contribute decision-makers (managers) specify the optimal amount of spare parts and control inventories properly.

The main goal of this study is to classify spare parts by applying the hybrid MCDM technique. The secondary goals in this study are 1- specifying some strategies to manage warehouse inventories. 2- Determining the benefits of spare parts multi-criteria categorization compared to the single-criterion categorization. 3- Merging the results of AHP and TOPSIS by applying a new conflation method.

Using the hybrid (BWM-AHP-TOPSIS) technique would help managers to make precise managerial decisions for reaching optimum inventories in a warehouse. BWM provides the criteria weights immediately only by determining the best and worst criteria. Pairwise comparisons in BWM are more consistent and the results are more reliable for managerial decision-making. Although applying AHP, when there are too many alternatives for prioritization, would be complex and time-consuming, it is a practical technique since it provides the opportunity for managerial decision-makers to consider both qualitative and quantitative criteria and convert quickly qualitative criteria to quantitative. Using expert choice software will solve the complexity and time-consumption problem of this technique if one encounters too many alternatives. Besides simplicity, the rationality of the TOPSIS concept, easy calculation, suitable computational performance, and especially visualization possibility, would help managers to make a pragmatic decisions. The proposed method was executed for a warehouse in an Iranian petrochemical company to help managers to make the precise decision for inventory management in the warehouse of the company. The suggested technique provides an appropriate solution for optimal control and management of inventories in the warehouse.

The remainder of this article is organized as follows. Section 2 represents the literature background of AHP, TOPSIS application in the multi-criteria classification of inventories, and the application of BWM in different studies. The methodology is explained in section 3. In section 4, the results are shown. Discussion is provided in section 5. Conclusion and suggestions are described in section 6.

Literature review

The literature in this study contains the application of AHP and TOPSIS for inventory classification. Also, the literature on BWM is studied as a newly developed method to drive the criteria weights.

AHP

Partovi and Burton (1993) categorized items by applying the AHP method. Quantitative and qualitative criteria are taken into account to classify inventory items. Items

are categorized into A, B, and C classes. Braglia et al. (2004) recommended a multi-criteria method to determine a proper strategy for spare parts inventory management. The AHP is applied to categorize inventory in terms of sensitivity. Some strategies (A. no storage, B. one-piece storage, C. Ordering when required, D. multi-item storage) for spare parts management are defined.

Antosz and Ratnayake (2019) used AHP to categorize spare parts based on critical evaluation criteria (logistic and maintenance requirements). Also, a practical classification of inventories based on spare parts sensitivity,

Table 1.

Limitations and points in the previous studies

Authors	Method	Limitations	Points
Flores & Whybarak (1986)	A joint criteria matrix	The methodology is difficult to implement.	Consider only quantitative criteria
Partovi & Anandarajan (2002)	Artificial neural network	Limitations in the number of criteria, and difficulty in entering many qualitative criteria.	Consider various criteria (quantitative and qualitative)
Ramanathan (2006)	Weighted Linear Optimization and DEA-like Model	Items with high value may classify in category A as an unimportant criterion.	Using different criteria weights
Ng (2007); Zhou & Fan (2007),	Weighted Linear Model	The weights of an item might be ignored. It is not easy to rank all criteria if there are too many criteria in a problem. Critical factors cannot be based on non-continuous categorical data.	Simplicity in execution
Hadi-Vencheh (2010),	Non-linear programming model (Ng improved model)	Critical factors cannot be based on non-continuous categorical data.	Determining criteria weights, using non-linear programming
Bhattacharya et al. (2007)	TOPSIS	Uncertainty and vagueness are not considered	Considering a variety of contradictory criteria
Chen (2012)	Multiple criteria inventory classification and TOPSIS	The models must be solved for each item separately.	Provide comprehensive performance and unique inventory categorization
Shahin & Gholami (2014)	TOPSIS	In an extension of results for other spare parts, decision-makers have to be cautious.	Risk Priority Number is considered as a categorization criterion.
Kaabi et al. (2018)	Genetic Algorithm, Weighted Sum and TOPSIS	Only quantitative criteria could be considered.	Classify inventory items without control policy.
Partovi & Burton (1993)	AHP	The subjectivity of decision-makers in the pairwise comparisons	Consider all qualitative and quantitative criteria
Gajpal et al. (1994); Braglia et al. (2004); Antosz & Ratnayak (2019); Nurcahyo & Malik (2017)	AHP	Subjectivity amount in the pairwise comparison.	Transparency in evaluating alternatives based on criteria and sub-criteria
Rezaei (2007); Cakir & Canbolat (2008); Zeng et al.(2012)	Fuzzy AHP	Not easy to use in the real world.	Using fuzzy numbers to overcome subjective judgment in AHP
Molenaers et al. (2012)	AHP and logic of decision diagrams	Up to date item information is necessary	Transparency and user-friendliness
Lolli et al. (2014)	AHP-K-Veto	It is unable to deliver an effective and realistic analysis due to its underlying assumptions	Prevent an item rated as high/bad on at least one criterion to be top/ bottom ranked in global aggregation
Duran, 2015	Fuzzy AHP	The calculation is time-consuming and complex if there are too many criteria, sub-criteria, and alternatives	Simplicity and the possibility of combining subjective parameters and linguistic words

Source: own compilation

the possibility of item failure, restoration time, potential suppliers, availability of technical characteristics, and maintenance type was done by applying AHP in a petrochemical factory (Molenaers et al., 2012). Gajpal et al. (1994) provided an AHP model for assessing the sensitivity of spare parts. They presented a practical application of the model in a large manufacturing organization. The stock-out implication, type of item, and lead time are selected as the criteria for evaluation. A multi-criteria inventory classification by integrating the AHP method and K-Means algorithm is recommended by Lolli et al. (2014). This method classifies inventories more precisely and less subjectively. Fuzzy AHP could be an appropriate solution when factories classify spare parts in terms of uncertain factors (Duran, 2015; Zeng et al., 2012; Cakir & Canbolat, 2008). To manage maintenance spare parts, Ferreira et al. (2018) employed fuzzy-AHP. Sensitivity, demand forecast, unit value, lead time, and the number of potential suppliers are taken into account as the main criteria.

Multi-criteria ABC categorization integrated with fuzzy AHP and data envelopment analysis is provided by Hadi-Vencheh and Mohamadghasemi (2011) to efficiently manage the inventory items and define the appropriate ordering policies. Yearly dollar usage, storage space constraint, average lot cost, and lead time are the appraisal criteria for classifying inventories. Nurcahyo and Malik (2017) recommended the AHP approach for precise multi-criteria classification of aircraft spare parts to decrease unessential downtime such as delay and cancelation because of spare part damage. AHP is used by Balaji and Kumar (2014) to classify the inventory of an automobile rubber components manufacturing industry and by Molnar and Horvath (2017) to demonstrate the interaction issues between the attributes included in the decision hierarchy.

TOPSIS

Shahin and Gholami (2014) employed TOPSIS to classify spare parts of a warehouse in an Iranian petrochemical company. Cost, sensitivity, lead time, and consumption rate are considered to categorize the spare parts. TOPSIS is proposed as the preferred methodology for classifying inventory items in a pharmaceutical company in India (Bhattacharya et al., 2007). Cost of Unit, lead time, rate of consumption, items' perishability, and raw materials storing cost are considered in categorizing the inventories.

TOPSIS is used for classifying inventory and calculating item value in the study of Chen (2012), Kaabi et al. (2018), and Kheybari et al. (2019).

BWM

To gain the optimum weights of alternatives with fewer pairwise comparisons and higher consistency ratios, Rezaei (2015); Rezaei et al. (2016) recommended the Best Worth Method.

BWM has been widely used in different fields of studies like supplier development (Aboutorab et al., 2018), supplier segmentation (Rezaei et al., 2015), supply chains

(Sharma et al., 2021), healthcare waste management (Pamučar, 2021).

Several scholarly articles integrated BWM with other techniques. For example, triangle fuzzy numbers (Maghsoodi et al., 2019; Ecer & Pamucar, 2020; Amiri et al., 2020), TOPSIS (You et al., 2017), fuzzy TOPSIS (Gupta, 2018b; Gupta & Barua, 2017), fuzzy-cumulative prospect theory (Zhao et al., 2019), BWM under probabilistic hesitant fuzzy sets (Li et al., 2019), fuzzy TOPSIS and fuzzy multi-objective linear programming (Lo et al., 2018). Mou et al. (2016; 2017) applied an intuitionistic fuzzy set in BWM to calculate the criteria weights.

Torkayesh et al. (2021) used BWM to find the weights of criteria in evaluating healthcare performance. Rough-fuzzy BWM is proposed to calculate the relative weights of sustainability criteria to choose sustainable hydrogen production technologies (Mei & Chen, 2021).

Table 1 represents limitations and points in some previous studies.

Contribution and novelty

Focusing on the literature review, one can find that managing and controlling warehouses could be done by inventories' classification. It has been proved that multi-criteria classification outperforms single-criterion classification. In this study, a hybrid method (BWM-AHP-TOPSIS) is recommended to classify spare parts to manage the warehouse. To the best of my knowledge, such a hybrid model has never been recommended for classifying inventories.

Reviewing the literature Molenaers et al. (2012) Balaji and Kumar (2014), Antosz and Ratnayake's (2016), Hadi-Vencheh and Mohamadghasemi (2011), Bhattacharya et al. (2007), and Chen (2012) Kheybari et al. (2019), AHP and TOPSIS are used for items classification. Since both of the methods are practical, AHP-TOPSIS integration could give managers more confidence to make managerial decision-making in the context of spare parts classification. To gain criteria weights, some researchers have used AHP but Rezaei (2015) suggested the BWM outperforms the AHP in terms of minimizing pairwise comparisons and consistency ratio. Therefore, the hybrid (BWM-AHP-TOPSIS) method not only provides decision-makers (managers) with reliable criteria weights but also contributes to the managerial decision-making in classifying spare parts and keeping optimal inventories.

Classifying all inventories in a warehouse takes too much time and would be a complex task. Previous research has recommended that a limited number of inventories could be selected and then classified based on the provided model. If the model was helpful, the procedure can be expanded.

In this study, 12 crucial spare parts of a gas turbine in the warehouse of a petrochemical company are selected to be classified based on the criteria (Critical, Cost, Consumption Rate, and Lead Time). Criteria weights are calculated by applying BWM. After that, by using AHP and TOPSIS methods, the score of each spare part is gained. Then, the max-min square method (Ajripour et

al., 2019) is recommended to combine the score of spare parts. Finally, using the Pareto principle, the spare parts are categorized into the ABC groups.

Methodology

The proposed integrated techniques are drawn in a flowchart (Figure 1). First, the goal of the study is determined. Decision-makers selected 4 criteria based on the previous studies. They appointed the value of alternatives based on each criterion. The data relating to the 12 strategic spare parts of the gas turbine are represented by interviewing eight experts. The criteria's weights are calculated by BWM since it provides fewer pairwise comparisons and higher consistency ratios. The score of alternatives could be gained by employing TOPSIS, which is capable of handling various, competing criteria, and AHP, which allows converting the qualitative criterion "critical" to a quantitative one (Bhattacharya et al., 2007). The final score of alternatives is integrated by applying the max-min square method. Then, spare parts will be classified based on the Pareto principle. Finally, inventory control strategies are provided to manage the warehouse.

most important criterion over the other criteria. Applying a 5-point scale where 1 shows equal importance and 5 reflects strongly more importance. The comparison matrix of most favorable-to-other is as follows: $A_B = (a_{B1}, a_{B2}, \dots, a_{Bn})$ where a_{Bj} shows the preference of the most important (best) criterion B over the criterion j. It would be evident that $a_{BB} = 1$.

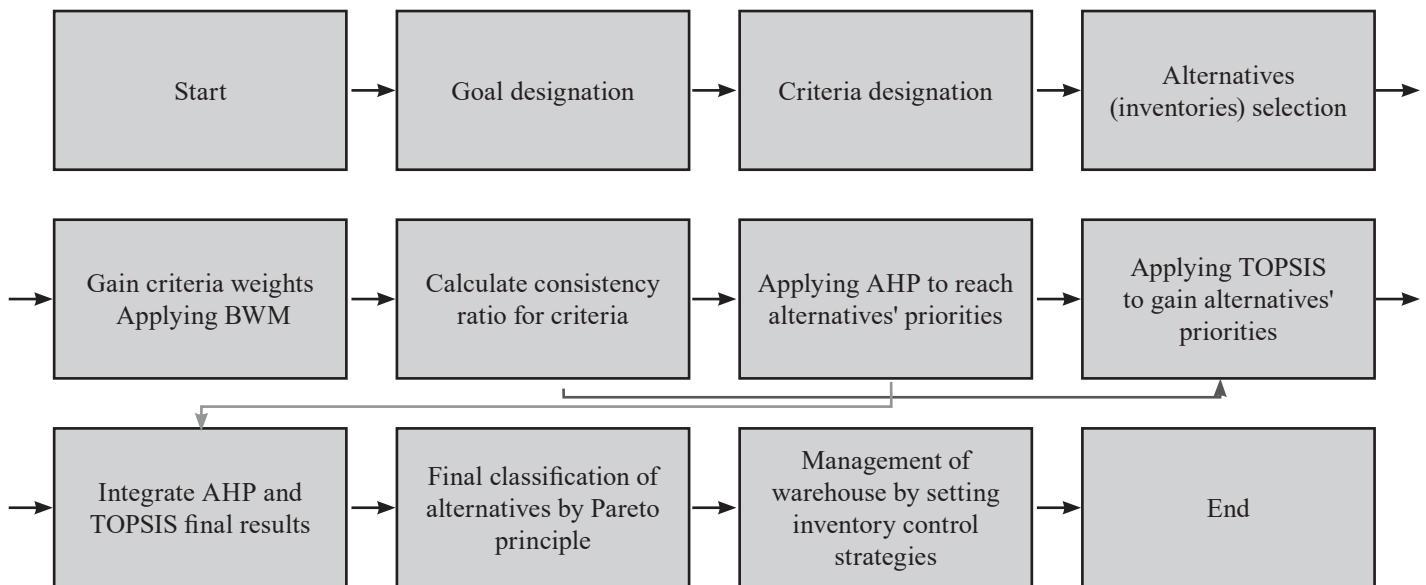
Step 4 – Decision-makers should make a pairwise comparison between other criteria and the least important (worst) criterion by applying a 5-point scale. The comparison matrix of other-to-least desirable is as follows: $A_w = (a_{1w}, a_{2w}, \dots, a_{nw})^T$ where a_{jw} represents the preference of criterion j over the least desirable (worst) criterion. It would be obvious that $a_{ww} = 1$.

Step 5 – Calculation of criteria's optimal weights ($w_1^*, w_2^*, \dots, w_n^*$).

The optimal weight for each pair of $\frac{w_B}{w_j}$ and $\frac{w_j}{w_w}$ should fulfill the requirement $\frac{w_B}{w_j} = a_{jw}$ and $\frac{w_j}{w_w} = a_{jw}$. A proper solution should be found where the maximum absolute differences $|\frac{w_B}{w_j} - a_{Bj}|$, and $|\frac{w_j}{w_w} - a_{jw}|$ for all j are minimized. Taking into account the weights' non-negativity and sum conditions, the following problem can be formulated:

Figure 1.

Research methodology



Source: author's drawing

Best Worst Method

To compute the most favorable criteria weights, BWM provides a linear mathematical model. The steps of BWM are as follows:

Step 1 – Decision-makers (DMs) should define a set of criteria $\{c_1, c_2, \dots, c_n\}$

Step 2 – DMs should determine the most important (best) and the least important (worst) criteria.

Step 3 – DMs should determine the preference of the

$$\begin{aligned} \min \max \left\{ \left| \frac{w_B}{w_j} - a_{Bj} \right|, \left| \frac{w_j}{w_w} - a_{jw} \right| \right\} \\ \text{s.t.} \\ \sum_j w_j = 1 \quad w_j \geq 0, \text{ for all } j \end{aligned} \tag{1}$$

Model (1) can be converted as follows:

$$\begin{aligned} \min \xi \\ \text{s.t.} \\ \left| \frac{w_B}{w_j} - a_{Bj} \right| \leq \xi \quad \text{for all } j \\ \left| \frac{w_j}{w_w} - a_{jw} \right| \leq \xi \quad \text{for all } j \\ \sum_j w_j = 1 \quad w_j \geq 0, \text{ for all } j \end{aligned} \tag{2}$$

By solving model (2), the optimum weights of criteria (w_1^* , w_2^* , ..., w_n^*) and the value of ξ will be gained.

Applying and the corresponding Consistency Index (max) values (Table 2), the Consistency Ratio (CR) of BWM can be calculated as follows (Rezaei, 2015):

$$CR = \frac{\xi^*}{Consistency\ Index} \quad (3)$$

The more the value of CR close to zero, the more consistent the vectors are.

$$IR = \frac{II}{IRI} \quad (5)$$

$$II = \frac{\lambda_{max} - n}{n - 1} \quad (6)$$

n: number of alternatives/criteria

Inconsistency Random Index can be extracted from Table 4.

Table 2

Best Worst Method Consistency Index

a_{BW}	1	2	3	4	5	6	7	8	9
Consistency Index	0	0.44	1	1.63	2.30	3	3.37	4.47	5.23

Source: own compilation based on Rezaei (2015)

Analytic Hierarchy Process

AHP was introduced by Saaty in the 1970s. The four simple steps in AHP are as follow (Sedghiyan et al., 2021):

Step 1 – Drawing decision-making hierarchical structure including goals, criteria, sub-criteria, and alternatives.

Step 2 – Making Pairwise comparisons for all criteria, sub-criteria, and alternatives by DMs based on the measurement scale (Table 3). If there is more than one decision-maker, a geometric could be used (Ajripour, 2020). The final pairwise comparison matrices would be organized as follow: $A = (a_{ij})$, where $i, j = 1, 2, 3, \dots, n$.

Step 3 – Normalize all pairwise matrices by applying equation (1). The arithmetic mean should be calculated in each row for all pairwise comparison matrices to gain the relative weights of criteria and alternatives.

$$n_i = \frac{a_i}{\sum_{i=1}^n a_i} \quad \text{for all alternative pairwise comparison matrices based on each criterion} \quad (1)$$

$$n_j = \frac{a_j}{\sum_{j=1}^n a_j} \quad \text{for criteria pairwise comparison matrix}$$

Step 4 – Applying equation (2) to calculate the final score of alternatives.

$$W = W_A \cdot W_c \quad (2)$$

where W_A and W_c are the matrices of relative weights for alternatives and criteria, respectively.

Step 5 – To calculate the biggest eigenvalue λ_{max} , first, equation (3) for calculating the weighted sum vector (WSV) must be used. Then using equation (4) provide the consistency vector value. Finally, the arithmetic mean is used to find λ_{max} .

$$WSV = A \cdot W \quad (3)$$

$$CV = \frac{WSV}{W_c \text{ or } W_A}, \quad \lambda_{max} = \frac{CV}{n} \quad (4)$$

n: number of alternatives/criteria

Step 6 – To calculate the Inconsistency Ratio (IR) for all pairwise comparison matrices, first, the inconsistency Index (II) should be computed by equation (6), then by applying equations (5), IR value will be gained. The inconsistency Ratio should be ≤ 0.1 ; otherwise, decision-makers should change their preferences in the decision matrices.

Table 3

Measurement scale

Intensity of importance	Description
1	Equal importance: A is equally preferred to B
3	Moderate importance: A is moderately more preferred than B
5	Strong importance: A is strongly more preferred than B
7	Very strong importance: A is very strongly more preferred than B
9	Extreme importance: A is extremely more preferred than B
2,4,6,8	Intermediate preferences

Source: own compilation based on Chatzimouratidis & Pilavachi (2009)

Table 4

Inconsistency Random Index table

n	1	2	3	4	5	6	7	8	9	10
IRI	0	0	0.58	0.9	1.12	1.24	1.32	1.41	1.45	1.51

Source: own compilation based on Sindhu et al. (2017), Aragonés-Beltrán et al. (2014)

TOPSIS

TOPSIS was first introduced by Hwang and Yoon (1981). The principle logic of this method is to obtain the ideal and the ant-ideal solution. The ideal solution maximizes positive criteria and minimizes negative criteria. In TOPSIS, alternatives are ranked based on their similarity to the ideal solution. This method chooses the best alternative based on the maximum distance from negative ideal solutions and minimum distance from positive ideal solutions.

The advantages TOPSIS technique are: simple, rational, easy to understand, simplicity in the calculation procedure (Roszkowska, 2011).

The main steps of the TOPSIS method are as follows (Ajripour et al., 2019; Sedghiyan et al., 2021; Ajripour & Alamian, 2021):

Step 1 – Establish the decision matrix and the weights of each criterion (the criteria weights are calculated by BMW in this study).

$$A = (a_{ij}) \text{ where } i = 1, 2, \dots, n; j = 1, 2, \dots, m$$

Step 2 – Normalize the decision matrix by applying equation (7) and calculate the weighted normalized decision matrix as equation (8):

$$n_{ij} = \frac{a_{ij}}{\sqrt{\sum_{i=1}^n a_{ij}^2}} \text{ where } i = 1, 2, \dots, n; j = 1, 2, \dots, m \quad (7)$$

$$V = w_j \cdot A_N \text{ where } i = 1, 2, \dots, n; j = 1, 2, \dots, m; \quad (8)$$

w_j is the weights of criteria

Step 3 – Find positive A_j^+ and negative A_j^- ideal solutions: The positive ideal solution (A_j^+) is the vector of the best value of each criterion in the matrix $V|V_j^+$

The negative ideal solution (A_j^-) is the vector of the best value of each criterion in the matrix $V|V_j^-$

The best value in the positive criterion is the maximum value, and the worst is the minimum. It would be vice versa in the negative criteria.

Step 4 – Applying equations (9) and (10) to calculate Euclidean distances from the positive ideal solution and the negative ideal solution.

$$S_i^+ = \sqrt{\sum_{j=1}^n (V_{ij} - V_j^+)^2} \quad (9)$$

$$S_i^- = \sqrt{\sum_{j=1}^n (V_{ij} - V_j^-)^2} \quad (10)$$

Step 5 – Using equations (11), the relative closeness (to the positive ideal solution will be gained.

$$Cl_i^* = \frac{S_i^-}{S_i^- + S_i^+}$$

The greater the relative closeness is, the higher the rank of alternative is.

Results

To support the maintenance process and protect machines against failure, the optimum required amount of spare parts should be stored at the warehouse. Sometimes factories encounter the issue of keeping a large volume of inventories and sometimes lack essential parts. Classification of inventories could help the factories to control and balance the inventories. This study aims to manage a warehouse with the help of classifying spare parts in an Iranian petrochemical company. Optimizing and controlling inventories in warehouses is an important strategic issue in the factory. Keeping all the inventories always in the warehouse is not necessary. So categorizing the inventories and using various strategies for inventory control is recommended. A multi-criterion hybrid MCDM technique is recommended to classify some of the inventories in a petrochemical factory. If the method provides valuable results, it will be expanded to categorize all the rest of the inventories.

A team of decision-makers, including eight experts, was formed. They reached an agreement to choose only 12 critical spare parts of the gas turbine as the alternatives in classification. Based on the literature review and availability of data in the factory, cost, critical,

consumption rate, and lead time (Table 5) are selected as the criteria for classifying the alternatives.

Table 5

Criteria

Names of Criteria	Description
C1: Cost	The last price of an inventory in the factory purchasing database.
C 2:Lead Time	The time between the orders of an inventory until reaching the factory warehouse.
C3:Consumption	The annual consumption rate of an inventory.
C4:Critical	The sensitivity of an inventory in three aspects of (production, safety, and environment)

Source: own compilation

Decision-makers are asked to determine the best and the worst criterion. Then, they should make a pairwise comparison between the best to the other criteria (Table 6-left) and the others to the worst (Table 6- right) using 5-point scale.

Table 6

Pairwise comparison between the best criterion to others (upper) – others to the worst (lower)

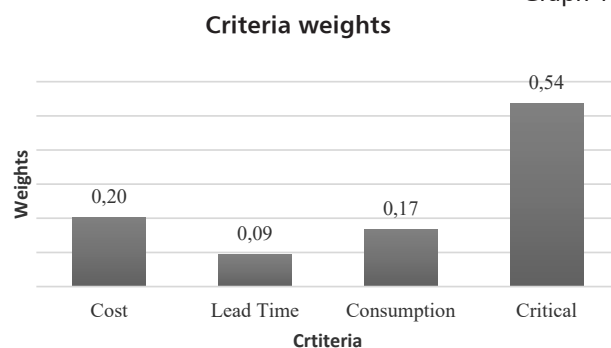
Best to Others	Cost	Lead Time	Consumption	Critical
Critical	3	5	3	1

Others to the Worst	Lead Time
Cost	3
Lead Time	1
Consumption	1
Critical	5

Source: own compilation

To calculate the final weights of the criteria, I used the BWM solver recommended by Rezaei (<https://bestworstmethod.com/software/>). The weights of the criteria are shown in Graph 1.

Graph 1



Source: own compilation

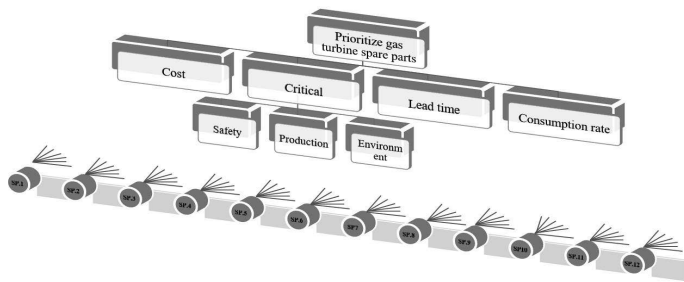
As shown in Graph 1, the most important criterion is “critical”, which gained 0.54 weight, and the least desirable is “lead time” with 0.09 weight.

The next step is to gain the alternatives score by applying AHP techniques.

Figure 2 shows the hierarchical structure of the problem.

Figure 2.

The hierarchical structure of the issue



Source: Author's drawing

The decision-makers provided detailed technical information for calculating the alternatives score in the AHP method. The relative weights of criteria are gained by the use of BWM (C_1 : 0.20; C_2 :0.09; C_3 : 0.17; $C_4 = 0.54$).

Four criteria are taken into account in this study. Cost, consumption rate, lead time, and critical. Except for critical, the three other criteria are quantitative ones. To convert the qualitative criterion “critical” to a quantitative one, Table 7 is defined with the help of decision-makers.

Table 8

Alternative values based on criteria

Spare part No.	Price (USD)	Lead Time (Working day)	Consumption Rate (year)	Production Critical	Safety Critical	Environment Critical
8	1854.69 \$	7	1	3	1	3
10	1341.25 \$	30	2	3	1	3
11	953.13 \$	30	3	3	3	1
13	903.13 \$	45	2	3	3	1
16	343.75 \$	50	3	2	1	1
21	231.25 \$	30	5	2	1	3
24	175 \$	2	12	2	1	1
25	156.25 \$	2	8	2	1	1
27	121.88 \$	30	8	2	1	1
28	112.50 \$	25	24	2	1	1
29	103.13 \$	20	8	2	1	1
38	15.63 \$	3	60	1	1	1

Source: Data retrieved from the warehouse system

Momeni (2010) has proposed that no need to do pairwise comparisons between alternatives based on each criterion and assess the inconsistency rate if all criteria are quantitative. Except “critical” criterion, all the other criteria are quantitative. By converting the qualitative criterion to quantitative one by using Table 7, no need

Table 7

Convert qualitative scale to quantitative “critical” criterion

Qualitative Score	Critical in Production			Critical in Safety		Critical in Environmental	
	High	Medium	Low	High	Low	High	Low
Quantitative Score	3	2	1	3	1	3	1
Inventories lack causes	stop	partial stop	does not affect	death or injury	does not affect	pollution or violates its laws	does not affect

Source: Author's work based on decision makers' opinion

Let's describe the sub-criteria of critical criterion. Critical in production means lack of a part makes an interruption in factory productions. Critical in safety means a shortage of a part may rise some dangers and cause death or injury. Critical in the environment means the absence of a part may endanger the environment.

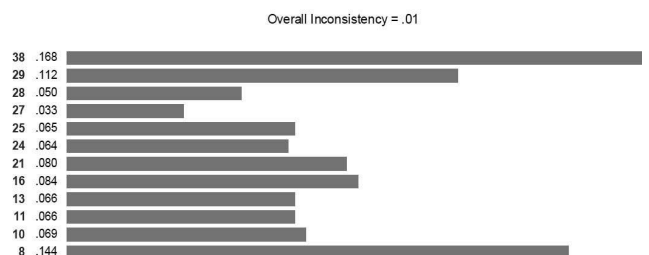
To assess alternatives based on the criteria, the values related to cost, lead times, and annual consumption rates are provided by the decision-makers concerning the last recorded information in the factory's warehouse database (Table 8). Considering Table 7, decision-makers determined the values for the production, safety, and environmental sub-criteria.

The weights of sub-criteria are determined by the factory's top manager. The safety, environmental, and production sub-criteria weights are 0.4, 0.35, 0.25, respectively.

to do a pairwise comparison between all alternatives. By applying expert choice software, the final score of alternatives is obtained (Figure 3).

Figure 3

Final score of alternatives



Source: Authors' data using expert choice calculation

Figure 3 shows that spare part No.38 got the highest score, and the minimum score is assigned to spare part No.27. The overall inconsistency is 0.01, which represents a good consistency of the pairwise comparisons.

The next step is finding alternative scores by applying the TOPSIS method. Considering Table 8 as the decision-making matrix, Graph 1 (criterion weights), and equations (7) and (8), the weighted normalized decision matrix is displayed in Table 9.

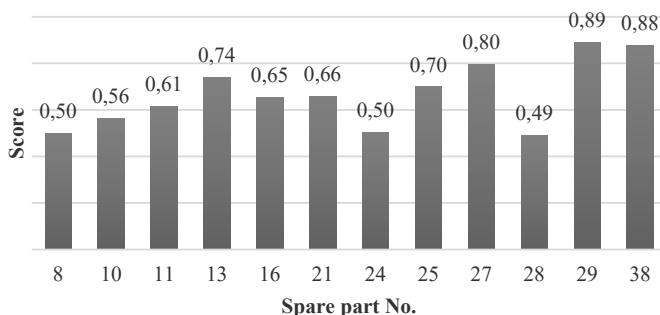
Table 9
Weighted normalized decision matrix

Criteria type	–	–	–	–
SP No.	Cost	Lead time	Consumption rate	Critical
8	0.000	0.02	0.70	0.32
10	0.338	0.19	0.04	0.32
11	0.240	0.19	0.06	0.31
13	0.018	0.19	0.04	0.31
16	0.002	0.03	0.44	0.28
21	0.003	0.03	0.50	0.26
24	0.583	0.64	0.00	0.20
25	0.197	0.64	0.02	0.20
27	0.009	0.06	0.08	0.28
28	0.670	0.19	0.00	0.25
29	0.026	0.13	0.16	0.17
38	0.000	0.01	0.20	0.20
w_j	0.20	0.09	0.17	0.54

Source: author's calculation

The values in the “critical” column are reached by integrating weighted normalized values of production, safety, and environment. Calculation example for the value 0.31 (spare part No.11): $(0.34*0.25+0.42*0.40+0.17*0.35=0.31)$. The values 0.34, 0.42, and 0.17, respectively, are the normalized values of production, safety, and environment. The 0.25, 0.40, and 0.35 are the weights of production, safety, and the environment, respectively, determined by the top management.

Graph 2
Final score of alternatives in TOPSIS



Source: author's drawing

Following the TOPSIS steps in section 3.3 and using Excel 2016, the final score of alternatives is gained, as illustrated in Graph 2.

Spare parts No.29 and 28 got the maximum and minimum scores, respectively. If we compare the final scores of alternatives provided by AHP and TOPSIS, there are some differences in the priority of alternatives. To reach a precise final score of alternatives, an integration method is used. Ajripour et al. (2019) provide an integration method called max-min square mean. Following the simple below steps to combine the final scores of alternatives.

Applying equations (12) and (13) to calculate the maximum and minimum value of alternatives, respectively. The final alternatives' combined scores will be calculated by using equation (14).

$$S_{max} = \frac{MAX S_i^2}{n} \quad \text{where } S_i \text{ is the maximum score of alternative } i$$

n: number of methods (AHP, TOPSIS)

$$S_{min} = \frac{Min S_i^2}{n} \quad \text{where } S_i \text{ is the minimum score of alternative } i$$

n: number of methods (AHP, TOPSIS)

$$S = \frac{S_{max} + S_{min}}{2}$$

Table 10 displays the final score of alternatives.

Table 10
Final alternatives' scores

Spare Part No.	Score		S_{max}	S_{min}	S	Final Ranks
	AHP	TOPSIS				
38	0.168	0.875	0.383	0.014	0.199	2
29	0.112	0.891	0.397	0.006	0.201	1
28	0.050	0.492	0.121	0.001	0.061	12
27	0.033	0.795	0.316	0.001	0.158	3
25	0.065	0.699	0.244	0.002	0.123	5
24	0.064	0.505	0.127	0.002	0.065	11
21	0.080	0.659	0.217	0.003	0.110	6
16	0.084	0.654	0.214	0.004	0.109	7
13	0.066	0.738	0.272	0.002	0.137	4
11	0.066	0.613	0.188	0.002	0.095	8
10	0.069	0.562	0.158	0.002	0.080	9
8	0.144	0.499	0.125	0.010	0.068	10

Source: author's calculation

In the real world, companies may have hundreds of parts in their warehouse for categorization. In this case, I recommend that the companies categorize the parts in different sections. For example, in a petrochemical company, parts related to the gas turbine, vessel, auxiliary equipment, etc. could be categorized separately in different sections.

Discussion

The final ranks of alternatives are obtained in Table 9. To categorize alternatives based on the ABC method and Pareto principle, one-fifth percentage of the spare parts gained the highest point, put in the A category, the next two-fifth percentage placed in the B group, and the C class contains the rest (two-fifth percentage) with the lowest score.

To find the optimal amount of each spare part in the warehouse, decision-makers used Antosz and Ratnayake’s (2016) storage and control strategies in addition to their opinions (Table 11).

Table 11

Inventory storage and control strategies

Class	A	B	C
Strategies	I.	II.	III.
	<ul style="list-style-type: none"> Spare parts must be kept. Precise inventory control Precedence in purchasing Keeping 5-times average consumption over lead time 	<ul style="list-style-type: none"> Keeping spare parts is not compulsory but is advised Second precedence in purchasing Keeping 3-times average consumption over lead time 	<ul style="list-style-type: none"> Reconsider keeping spare parts Buy if it is needed If lack of spare parts causes critical implications, keeping 2-times average consumption over lead time

Source: Antosz & Ratnayake (2016) and experts’ opinion

Based on the strategies provided in Table 11, and the final scores in Table 10, spare parts are classified and the storage and control strategies are determined for all the alternatives (Table 12).

The spare parts are categorized not only based on ABC multi-criteria classification but also ABC single-criterion classification (ABCSC). As it is shown, the multi-criteria classification method placed most of the spare parts in a different category than the single criterion. For example, spare parts No.38 and 29 are grouped in category A with regards to the ABCMC but based on ABCSC, they are categorized in group C. Implementing storage and control strategies for the spare parts, the minimum spare parts which must be kept in the warehouse, the adjusted inventory level, and the adjusted inventories incomes or expenses could be calculated. In column seventh (Table12), the minimum parts that must be kept in the warehouse plus one more as a safety stock are calculated. For instance, the strategy “I” is assigned to spare part No. 38 with A categorization. The lead time for spare part No.38 is three working days, and its’ annual consumption is 60. The average number used during the lead time is $(\frac{60 \times 3}{365} = 0.49)$. Considering strategy “I”, the minimum spare parts 38 that must be kept is $(0.49 \times 5 = 2.47)$. A safety stock must be considered, so the final amount of spare part No.38 for keeping in the warehouse would be $2.47 + 1 = 3.4 \approx 3$ but ABCSC classification illustrates that spare part No.38 is categorized in group C.

Column eighth Table 12 displays the adjusted inventory level. It would be calculated by subtracting the current inventory from the minimum parts that must be kept in the warehouse (e.g., spare part No.24: 1 (current inventory) - 1 (Minimum parts must be kept in warehouse+1) = 0 (adjusted inventory). A positive number shows the extra spare parts in the warehouse, while a negative one represents the lack of spare parts in the warehouse.

Adjusted inventory- income/expense in column ninth indicates the income that the factory gains if it may sell the extra spare parts or the expenses that the factory must pay to purchase the required inventories. For example, the adjusted inventory level for spare part No.27 is -2 i.e., the

Table 12

Classifying spare parts – storage and control strategies

Spare Part No.	Score	ABCMC classification	Storage and control strategy	Price (USD)	Current inventory	Minimum parts must be kept in warehouse + 1	Adjust inventory level	Adjust inventory- Income / Expense (USD)	ABCSC classification
38	0.199	A	I	15.63	6	3	3	46.89	C
29	0.201	A	I	103.13	2	3	-1	-103.13	C
28	0.061	C	III	112.5	1	3	-2	-225.00	C
27	0.158	B	II	121.88	1	3	-2	-243.76	C
25	0.123	B	II	156.25	2	1	1	156.25	C
24	0.065	C	III	175	1	1	0	0	B
21	0.110	B	II	231.25	2	2	0	0	B
16	0.109	B	II	343.75	2	2	0	0	B
13	0.137	B	II	903.13	2	2	0	0	B
11	0.095	C	III	953.13	2	1	1	953.13	B
10	0.080	C	III	1341.25	1	1	0	0	A
8	0.068	C	III	1854.69	1	1	0	0	A

Source: author’s calculation

factory is in lacks spare part No.27, and it is required to buy two more parts No.27. Purchasing 2 more spare part No.27 costs the factory $243.74\$ = 2 * 121.88\$$.

In summary, after implementing storage and control strategies, the inventory of one spare part (No.29) must be increased, and one (No.38) should be decreased in category A. In category B, spare parts No.21,16, and 13 stayed without any changes. But spare part No.27 must be increased, and No.25 could be decreased. Although spare parts No.10,8, and 24 in group C remained without any alters, spare part No.25 must be increased, and No.11 should be decreased.

Comparing the final results of ABCMC classification and the results of ABCSC categorization, only four spare parts (No.28, 21, 16, and 13) in the ABCMC method are put in the same category as the ABCSC. Spare parts 38 and 39 in the ABCMC are placed in category A while in ABCSC are placed in class C. Group B in ABCMC classification is included five spare parts (No.27, 25, 21, 16, 13). Three out of five have the same category as ABCSC, only spare parts No.27 and 25 in ABCSC classification are placed in category C. The spare parts categorized in group C based on the ABCMC, except spare part No.28, have gained a different class in the ABCSC classification.

These differences between the ABCMC classification and the ABCSC categorization are because the latter method just takes into account the monetary value of annual consumption as a criterion for spare parts classification while the ABCMC considers different criteria.

In my study, I used a hybrid MCDM technique. The results of items' classification in ABC single criterion and the results in ABC multi-criterion are compared. The previous studies (Bhattacharya et al., 2007; Gajpal et al., 1994; Braglia et al., 2004; Antosz & Ratnayak, 2019; Nurcahyo & Malik, 2017; Rezaei, 2007; Cakir & Canbolat, 2008; Zeng et al., 2012; Molenaers et al., 2012; Duran, 2015) have used multi-criteria in the prioritization of items, but none of them have compared the results provided from ABC traditional method (single criterion) and ABC multi-criteria for each item.

The only study that has provided the results of item classification using ABC (single criterion) besides the results provided by multi-criteria classification, is the study of Partovi and Burton (1993) which used just AHP.

Integration of AHP and TOPSIS has never been used in the former research of item categorization. The only studies that proposed an integration model are Kaabi et al. (2018) which is a hybrid model based on a genetic algorithm, weighted sum, and TOPSIS. The AHP-TOPSIS integrated method can consider a variety of quantitative and qualitative criteria at the same time. This method has a low likelihood of error and can be used to solve the real-time MCDM problem. Besides, in-depth technical knowledge of the AHP and TOPSIS methods is not required. This technique is computationally robust and straightforward, and it can handle a high number of input and output variables.

In contrast to the limitations of previous studies (Table 1-column 3), the proposed hybrid (BWM-AHP-TOPSIS)

method is practical, easy to use, considers both qualitative and quantitative criteria, active, usable, and trustworthy for managerial decision making.

Conclusion and suggestions

Managing inventories in a factory's warehouse is an important issue that managers encounter. Some factories have used the ABC method to classify and manage inventories, but it may not provide the best solution. Employing multi-criteria besides applying a hybrid MCDM technique for the classification of inventories would help managers to manage and control a warehouse appropriately. In this study, the selected inventories were classified based on multi-criteria (Cost, Lead time, Consumption, and critical).

Applying integrated multi-criteria decision-making techniques could help managers control and manage inventories in a factory's warehouse. In this study, BWM-AHP-TOPSIS as a hybrid method is proposed to classify the selected inventories. To calculate the criteria weights, BWM was applied since it provides fewer comparisons and higher consistency. Having both quantitative and qualitative criteria, AHP and TOPSIS methods were employed to classify spare parts. Applying expert choice software provided quick and rational results for the AHP problem. Due to the capability of the TOPSIS approach to handling various and competing criteria, it was employed to determine the category of spare parts for optimal inventory control. So, the proposed hybrid method is practical and easy to use which helps managers to make managerial decisions regarding warehouse management as the result of inventory management.

Applying "Maximum-Minimum Square Mean" method, provided the final results of alternatives.

Based on the final integrated rank of alternatives and considering the Pareto principle, two spare parts containing the highest point are categorized in group A, the next five spare parts with descended scores are classified in group B, and finally, the five remains are grouped in category C.

Inventory storage and control strategies (Table 11) are defined to reach an optimum inventory in the factory's warehouse.

The limitation of my study: 1. The limited number of selected spare parts 2. Lack of data in the company's warehouse database.

The hybrid technique has shown its practicability in the management of warehouses by classification of inventories. So, the technique can be expanded to categorize all of the inventories in the factory's warehouse.

Inventories' multi-criteria classification based on some other criteria like reliability, deterioration, etc., is strongly suggested. Applying another hybrid method such as BWM-fuzzy AHP-fuzzy TOPSIS or other techniques like Simple Additive Weighting (SAW), Vlekriterijumsko KOMPromisno Rangiranje (VIKOR), EElimination Et Choice Translating REALity (ELECTRE), Preference Ranking Organization Method for Enrichment

Evaluations (PROMETHEE) is recommended. The integration methods like Borda, Copeland, and average methods could be employed to combine the final results of the MCDM techniques.

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