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CSR in Developing Countries: Case Study in Vietnam

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This article provides a review of the practice of corporate social responsibility (CSR) in Vietnamese enterprises, especially in Vietnamese small and medium enterprises (SMEs). To do so, this article first reviewed the conceptual framework of CSR and CSR in developing countries. In addition to enhancing the competitiveness of Vietnamese enterprises in general, Vietnamese SMEs in particular, this study highlights the lessons learned from CSR empirical studies in developing countries. Furthermore, based on the analysis of Vietnamese enterprises and CSR practices in Vietnam, the article collates the recommendations given by researchers to strengthen and improve the implementation of CSR in Vietnam as well as provide some suggestions to help Vietnamese enterprises get success in applying CSR in their sustainable business objectives. This article concludes the implementation of CSR in Vietnam is still limited, and there are many obstacles and limitations in applying CSR not only from the business itself but also from the operating environment. Therefore, to implement and integrate CSR into Vietnamese enterprises' business strategies, CSR awareness should be improved as well as the legal framework for implementing CSR.

Key words: Corporate Social Responsibility, CSR, Developing Countries, Vietnam, Vietnamese SMEs

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Introduction

Since corporate social responsibility (CSR) first emerged from the seminal work of Bowen in 1953, it has attracted increasing attention of either scholar, social organizations, and governments or other stakeholders both in developed and developing countries (Ali, Frynas, and Mahmood 2017). In developed countries, CSR activities have received cumulative attention from businesses, which is united into the business strategy of the business. CSR is cogitated a key factor

for sustainable growth and improved profitability. While, it is hard to apply CSR in developing countries since their legal system is partial and monopoly, corruption, and group interests toughly influence society.

In Vietnam, a developing country, many big companies are aware that in order to grow sustainably, organizations must adhere to the principles of environmental protection, gender equality, equal pay, labour safety, labour rights, talent management, and community growth. They implemented hundreds of actions; such as saving energy, using recycled materials, reducing carbon emissions, or some donation as the school building, help sufferers of natural disasters. There are some ongoing CSR activities, such as Pratham Books (Creating an open-sourced platform for translating books); and GiveDirectly (Creating opportunity through mobile cash transfers) implementing by Google; Since 2006, 'Microsoft company has had an official commitment to regard human rights as a signatory of the United Nations Global Compact' (Dudovskiy 2017). However, with more than 97 percent of registered enterprises are small and medium enterprises (SMEs) (Shinozaki 2012). The implementation and application of CSR in Vietnamese enterprises are facing many difficulties and limitations. Because of the limited by the financial resources, personnel, size of the business, in most cases the business owner is also the director (Nguyen et al. 2015). Moreover, Vietnamese SMEs focus more on maximizing profits than on social responsibility.

Recent studies concluded that SMEs are playing an essential role in the national economy, especially in Vietnam. According to the report of the Asian Development Bank, Vietnamese SMEs account for up to 97.4 percent of all registered firms. They account for 77.3 percent of the country's total labour force and contribute 26 percent of Vietnam's GDP (Shinozaki 2012). Furthermore, recent researches have shown that CSR benefits both business and society, both large and small and medium enterprises (Udayasankar 2007). According to recent studies, CSR capabilities are defined as a company's knowledge, skills, and processes linked to the planning, implementation, and assessment of CSR initiatives (Lee, Park, and Lee 2013). Such CSR capabilities could be one of the most critical strategic approaches in a company's CSR efforts. CSR helps to improve the image and reputation of the business; increase sale volumes; increase employee motivation, increase attractiveness to potential recruits, etc. (Jenkins 2006; Dzansi 2011).

To achieve the objective of sustainable development, Vietnamese

enterprises are not only complying with government mandated standards of employment, environment, and society, but also active with social responsibility which is not regulated by law. Because of new perceptions, many large enterprises in Vietnam have put CSR on the top priority to integrate into their business strategy. Similarly, Vietnamese SMEs also have to develop and integrate CSR into their business strategy. However, awareness of CSR and their CSR activities are inadequate. Thus, the main goal of this article is to give a descriptive analysis of the practices of CSR in Vietnam, especially in Vietnamese SMEs based on available literature and published data.

Theoretical Background

CORPORATE SOCIAL RESPONSIBILITY

Since its first appearance in 1953, the CSR concept has had more than 60 years of history. However, it is still complex and complicated. It is complex not only because of the nature and context of the problems, but it is also complicated by four distinct agendas which are engaged in the definitional enterprise (Sheehy 2015). There can be identified numerous attempts in the literature to define CSR. Many scholars have attempted to develop CSR concepts such as Carroll (1979; 1999), Wood (1991), Van Marrewijk (2003), Dahlsrud (2008). However, the authors have not reached the consensus about CSR definition as CSR varies in context, content, process, and value. The early definition of CSR more often referred to social responsibility than to CSR, 'It refers to the obligations of businessmen to pursue those policies, to make those decisions, or to follow those lines of action which are desirable in terms of the objectives and values of our society' (Bowen 1953). In the paper published in 1979, Archie Carroll proposed a four-part definition of CSR: 'The social responsibility of business encompasses the economic, legal, ethical and discretionary expectations that society has of organization at a given point in time' (Carroll 1979). In another paper published in 1991, the pyramid of CSR that was introduced by Carroll is one of the earliest efforts to combine the economic and social responsibilities of the corporation (Carroll 1991).

In another study, conducted by Dahlsrud, CSR definitions could be categorized by five dimensions, including Environmental; Social; Economic; Stakeholder; and Voluntariness (Dahlsrud 2008). Dahlsrud (2008) also pointed to the definition of CSR with the highest frequency counts from Google to the Commission of the European Communities, which defined CSR as 'A concept whereby companies

integrate social and environmental concerns in their business operations and in their interaction with their stakeholders on a voluntary basis' (European Commission 2002). The rest of the 37 analytical definitions in Dahlsrud's (2008) study refer to four, three, two or even just one dimensions of CSR. However, in the recent review article, Wang and Gao (2016) summarized the definition of CSR into four common perspectives, including:

1. An integrative perspective, namely, those definitions generated from a spectrum of views ranging from stakeholder concerns to social issues;
2. An economic perspective, espoused by those researchers who believe that the aim of CSR activities is the maximization of profit, which emphasizes the benefits to shareholders and internal stakeholders;
3. A voluntary perspective, espoused by those researchers who believe that firms should take some philanthropic action in accordance with local laws to improve social welfare;
4. A public perspective, where scholars argue that a CSR strategy should be designed to fit the social system.

Hence, it can be stated that CSR is more than charity and philanthropy. CSR is the commitment of enterprises to integrate social and environmental responsibility into their business operations to improve the quality of life of stakeholders. CSR is 'the continuing commitment by business to contribute to the economic development while improving the quality of life of the workforce and their families as well as of the community and society at large' (WBSCD 2000). CSR is about creating business and social value, about aligning and balancing shareholder, about societal and environmental interests. CSR is defined as the method through which a business achieves a balance of economic, environmental, and social requirements while at the same time addresses the expectation of shareholders and stakeholders (UNIDO 2010). An effective CSR strategy balances the interests of shareholders, society, and the planet, making businesses stronger and more sustainable.

CSR IN DEVELOPING COUNTRIES

A difference between the high interests with the concept of CSR in general, there is a limited systematic review of the concept of CSR in developing countries to date. The unique elements of CSR in developing countries have been referred to the literature, with CSR commonly characterized as less formalized, more sunken and more phil-

anthropic (Jamali and Neville 2011). Research by Ali, Frynas, and Mahmood (2017) concluded that the CSR report received different attention from stakeholders in developed and developing countries. Interested stakeholders in developed countries are usually shareholders, regulators, creditors, investors, environmentalists and the media, while in developing countries they are international buyers, foreign investors, international media and international regulatory bodies such as World Bank. Moreover, in contrast to developed countries, companies in developing nations receive relatively lower pressures in the publication of CSR reports.

In another context, a study by Jamali and Mirshak (2007) shows that economic and legal factors are receiving more interest in developing countries in pursuing CSR. This study also concludes that CSR in developing countries is very different from developed countries because of the weak institutional environment emphasized by arbitrary law enforcement, bureaucracy inconsistency, insecurity of property rights and corruption. Operating in a situation like this, a company that strictly enforces rules and regulations can be considered a responsible company. Further enhancing the need to explore CSR in developing countries is a different argument against the possibility of converting the frameworks and conclusions drawn from developed countries into developing countries (Idemudia 2011).

Raynard and Forstater (2002) stated that CSR imposes new demands on SMEs in developing countries. Social and environmental principles are progressively a precondition for doing business with transnational corporations. This is expressed regarding individual supply chain codes of conduct and certification programs across the industry. Market change can increase the impact of environmental and social concerns beyond issues directly related to transnational corporations. This can happen through local competition, by strengthening the mechanism to ensure compliance with local law, by targeting investment or through changing consumer demand. Therefore, CSR needs to be integrated into core business strategies. If this is done, it can still be strong, even if the CSR is a vulnerable charity allowance to cut costs. The long-term success of CSR will be based on its ability to be at the core of its business and development strategy, thereby becoming part of 'business as usual.'

In Vietnam, a developing country, there is limited theoretical and empirical contributions to CSR to date. According to Nguyen (2013), CSR is understood as the enterprise commitments to contribute to the sustainable economic development, through improving living quality of labourers, of their own families, of the community and of the

TABLE 1 SME in East and Southeast Asia

Region	Country	(1)	(2)	(3)
East Asia	Japan	99.7	69.4	47.7
	Korea	99.9	87.7	47.6
	China	99.0	75.0	58.5
Southeast Asia	Brunei	98.4	58.0	22.0
	Cambodia	98.5	–	85.0
	Indonesia	99.9	97.0	56.5
	Lao PDR	99.8	83.0	6 to 9
	Malaysia	99.2	59.0	31.9
	Myanmar	92.0	–	–
	Philippines	99.6	63.2	35.7
	Singapore	99.4	62.3	46.3
	Thailand	99.8	78.2	36.7
	Vietnam	97.4	77.3	26.0

NOTES Column headings are as follows: (1) number of enterprises (% of total), (2) number of employees (% of total), (3) contribution to GDP (%). Adapted from Shinozaki (2012).

whole society, in the way which is beneficial to both the enterprises and the general development of the society. Furthermore, in the context of globalization and international integration, Vietnamese companies will not be able to gain access to the global market if the companies fail to implement their social responsibility effectively. For the purpose of sustainable development, companies must comply with environmental protection standards, gender equality, labour safety, labour rights, equal pay, staff training and community development. Thus, CSR has become one of the essential requirements of Vietnamese companies.

Practices of CSR in Vietnam

VIETNAMESE ENTERPRISE

In Vietnam, the number of registered enterprises increase on average by 14 percent annually from 2011 to 2016 (figure 1), and most of the registered enterprises are SMEs (table 1). Besides, recent researches concluded that SMEs are playing a vital role in the national economy, especially in the Vietnamese economy.

In fact, in 2012, Vietnamese SMEs account for 97.4 percent of the total number of registered companies. SMEs account for 77.3 percent of the country's total labour force and contribute 26 percent of Vietnam's GDP (Shinozaki 2012). Moreover, in a recent survey by CPA Australia, the institute reported that 90.7 percent of Vietnamese

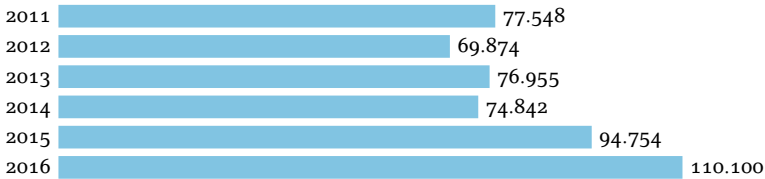


FIGURE 1 Number of Newly Registered Enterprises from 2011–2016 in Vietnam (based on data from <http://www.gso.gov.vn>)

SMEs grew in 2017 and 93.7 percent expect to grow in the next 12 months. While there is only 47.5 percent of Singapore's small businesses reported that they grew in 2017, and 93.4 percent of Indonesian small businesses reported they grew. These figures partly explain the importance of SMEs to Vietnam's economic development, and the growing interest of domestic and foreign researchers in Vietnamese SMEs as well.

According to article 6 of the Vietnamese Government's Decree No. 39/2018/ND-CP, 'SMEs are business establishments registered in accordance with the law. It is divided into three levels: micro, small and medium scale (the total capital equivalent to the total assets determined in the enterprise's balance sheet or the average labour force is a priority criterion)' (table 2). SMEs include a very broad range of businesses from traditional family businesses to companies with hundreds of employees.

Vietnamese SMEs is limited by the financial resources, personnel, size of the business, and usually, the business owner is also the director. They focus more on profit maximization than on social responsibility. However, recent studies implied that CSR benefits both business and society, for both large and SMEs (Udayasankar 2007). The benefits of implementing CSR in SMEs include: improved image and reputation; improved trust and understanding; larger, more prominent profile; better market position; increased sale volumes; increased employer motivation; increased attractiveness to potential recruits; cost savings and increased efficiency; enhanced risk management; benefits for company culture; enhanced customer satisfaction, employee loyalty, etc. (Jenkins 2006; Dzansi 2011).

Therefore, this paper focuses on the analysis of Vietnamese SMEs and the practice of CSR in Vietnamese SMEs in particular and Vietnamese enterprises in general. In the next sections, the article will focus on the implementation of CSR in Vietnam as well as give some recommendations to help Vietnamese enterprises get success in applying CSR in their sustainable business objectives.

TABLE 2 SME Criteria by Vietnamese Government's Decree No. 39/2018/ND-CP

	Company Category					
	Micro		Small		Medium-sized	
	(1)	(2)	(1)	(2)	(1)	(2)
(i)	$A \leq 3$ or $R \leq 3$	$L \leq 10$	$A \leq 20$ or $R \leq 50$	$10 < L \leq 100$	$A \leq 100$ or $R \leq 200$	$100 < L \leq 200$
(ii)	$A \leq 3$ or $R \leq 3$	$L \leq 10$	$A \leq 20$ or $R \leq 50$	$10 < L \leq 100$	$A \leq 100$ or $R \leq 200$	$100 < L \leq 200$
(iii)	$A \leq 3$ or $R \leq 10$	$L \leq 10$	$A \leq 50$ or $R \leq 100$	$10 < L \leq 50$	$A \leq 100$ or $R \leq 300$	$50 < L \leq 100$

NOTES Column headings are as follows: (1) Total assets and total revenue of the year (billion VNĐ), (2) the average number of employees participating in social insurance of the year. Row headings are as follows: (i) agriculture, forestry and fisheries, (ii) industry and construction, (iii) trade and services.

CSR IN VIETNAM

According to data collected from secondary sources in Vietnam and abroad. It is can be said that there are three milestones in the history of CSR in Vietnam, including:

- First, in 2000s CSR has been introduced in Vietnam through the operation of the multinational companies investing in Vietnam, for example, Honda-Vietnam, Coca-Cola Vietnam, Unilever-Vietnam, Microsoft, HP ... These companies commonly develop the Code of Conduct and standards of business culture which are universal in order to apply in various geographical markets (Nguyen et al. 2015). A number of successful CSR programs at the time were launched, such as 'I love Vietnam' program of Honda Vietnam in 2004; Vision rehabilitation program for poor children of Western Union in 2004; Coca-Cola Vietnam began the Clean Water for Communities project in 2006. Unilever-Vietnam began the Protection Vietnamese Smile program in 1998, Sanitation program for children in mountainous provinces in 2007; Program for the Development of Sustainable Community Informatics Centers in 64 Provinces of Vietnam (TOPIC64), sponsored by Microsoft, Qualcomm, Hewlett Packard and USAID from 2006; The program supports congenital malformations and support for victims of Can Tho bridge collapse of VinaCapital and Samsung in 2007.
- Second, in 2005, the Vietnamese government also started to encourage companies to protect the environment and improve working conditions. They issued new rules for sustainable development, typical of this are Agenda 21 and the new Law of

Environmental Protection. Environmental police have been set up to take measures to stop polluting companies, and companies will be subject to separate penalties for contaminated sewage. With the support of the Vietnam Chamber of Commerce and Industry (VCCI), the Vietnam Business Linking Initiative (VBLI) has established close relationships with NGOs, other international organizations as well as businesses using foreign capital. Thanks to this program, SMEs shoe manufacturers and industrial textiles can participate in training programs or consultancy services as well as enhance awareness of CSR knowledge. The most important event in 2005 was that VBLI started awarding 'CSR Awards' to the most committed businesses. Some typical programs such as 'P/s protect Vietnamese smile' program of Unilever-Vietnam; '6 million glasses of milk for Vietnamese children' program implemented by Vinamilk; Scholarship fund 'firefly lights' established by Dutch Lady.

- Third, 2010 marked the change in awareness of Vietnamese enterprises, especially Vietnamese SMEs. Thanks to the EU-funded project 'Helping Vietnamese SMEs Adapt & Adopt CSR for Improved Linkages with Global Supply Chains in Sustainable', implemented in Vietnam by the United Nations Industrial Development Organization (UNIDO) from 2010 to 2013. There are many Vietnamese SMEs are trained and updated their CSR knowledge through training sessions or seminars. According to the surveys that conducted by Taylor Nelson Sofres Viet Nam in 2013, it can be concluded that there is clear evidence of increased awareness about, understanding and practice of CSR in the sector of SMEs within the time period of the UNIDO's project in Vietnam (table 3) (UNIDO 2013).

In another context, some recent studies concluded that Vietnamese enterprises which have integrated CSR into their business strategy regularly are multinational, large or export companies. Meanwhile, many SMEs in Vietnam are not fully aware of CSR, not aware of the benefits and opportunities that CSR can bring to the business. They frequently focus only on exploiting the resources available to maximize profits but forget the interests of customers, responsibility to labourers, to eco-environment, to the community and the future generations (Nguyen et al. 2015).

According to a study conducted by World Bank in Vietnam, the biggest barriers and challenges to the implementation of CSR of enterprises are:

TABLE 3 CSR Awareness Score Distribution of Vietnamese SMEs

Range of awareness score*	Total		Textiles and garment		Leather and footwear		Electronics	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
< 10	0.3	0.0	0.0	0.0	0.6	0.0	0.0	0.0
11-20	0.6	0.0	0.5	0.0	0.6	0.0	0.0	0.0
21-30	3.7	2.9	4.1	2.5	3.1	2.4	2.0	2.4
31-40	14.8	17.8	16.8	18.5	14.0	17.0	8.0	14.6
41-50	53.3	60.1	50.7	56.0	53.8	64.5	60.0	58.6
> 51	28.4	20.5	28.0	22.5	27.6	16.4	30.0	24.3

NOTES * The higher scores the higher awareness. Scores based on the answers (corresponds to values from 0 to 3) that each respondent gave to each statement. Each respondent could get a score between 0 (if a respondent said that all 20 statements were not at all important) and 60 (if a respondent said that all 20 statements were very important). (1) 'Baseline' and (2) 'End-line' refer to the year when the survey was conducted on the similar sample of 400 SMEs, in 2009 and 2013, respectively. Adapted from UNIDO (2013).

- Insufficient awareness of the concept of social responsibility within and between corporates in Vietnam;
- Productivity being affected when performing multiple sets of Codes of Conduct synchronously;
- Lack of financial and technical resources for the implementation of social responsibility standards (especially for SMEs);
- Confusion for corporates due to differences between Code of Conduct and the Labour Code;
- CSR activities that have been implemented without transparency are hindering benefits brought by potential markets to businesses;
- State's regulations affect the results of the implementation of the code of conduct; and
- The habits in consumer culture have not promoted the role of customers in protecting products of corporates that have well implemented social responsibility as well as the fighting spirit against corporate with commercial frauds.

In fact, today's CSR activities in Vietnam focus on some successful programs implemented by multinational companies such as Honda-Vietnam, Coca-Cola Vietnam, Unilever-Vietnam, Microsoft, HP ... CSR activities of Vietnamese SMEs, if any, are only charitable activities for some individuals or communities where the business operates. Moreover, besides the 'good programs' as mentioned above, there have been many 'bad activities' - cases of business ethics vio-

lations, severe environmental and human health violations. For example, the most serious recent incident has been the Vietnam sea catastrophe in 2016, which is a water pollution crisis that has affected central provinces of Vietnam – The Formosa steel plant is suspected to be the source of the toxic chemical waste; or some typical incidents have happened in the past, such as milk containing birth control drug, melamine of China; industrial alcohol made fatal to consumers; poor quality counterfeit fertilizers; soya source containing 3-MCPD; growth stimulators passed on cattle through animal feed are not fully resolved; direct discharge of untreated sewage into Vedan's Thi Vai River in Vietnam . . . This is due to the lack of awareness of CSR that has serious consequences for the environment, society, and consumers (Nguyen and Duc 2008).

Also, due to the lack of social responsibility regulations from the government, the Vietnamese mechanisms and punishments are not sufficient to prevent enterprises from violating the law, as a result, many enterprises do not care about these lawsuits. There have been many cases of violations that have been identified but also difficult to resolve, such as the controversy over the sanctioning form of Vedan in 2008 or the recent matter of Formosa Ha Tinh in 2016 (Phan and Szilárd 2017). Similarly, in October 2008, Vinh Long province detected 11 companies producing poor quality fertilizers, of which the useful ingredient was almost zero. However, these companies were fined only a total of VND 130 million. Obviously, fines are too small compared to the profits earned from fraud, as well as its impact on farmers.

Conclusions

CSR in developing countries has evolved into a significant body of scholarship that retains its nuances, peculiarities, and distinctiveness as a platform for knowledge generation (Jamali and Karam 2016). However, the implementation of CSR in developing countries is still limited. Especially in Vietnam, a developing country, the implementation of CSR also encountered many obstacles and limitations. These obstacles and limitations come not only from the business itself but also from the operating environment. For example, Vietnamese SMEs focus more on maximizing profits than on social responsibility. Furthermore, they lack awareness of CSR, lack of financial and technical resources for the implementation of social responsibility standards.

Furthermore, the Vietnamese legal system is incomplete, and monopoly, corruption, and group interests strongly influence soci-

ety. Furthermore, there are limitations of social responsibility regulations from the government, the Vietnamese mechanisms and punishments are not sufficient to prevent enterprises from violating the law. Therefore, to implement and integrate CSR into Vietnamese enterprises' business strategies, CSR awareness should be improved as well as the legal framework for implementing CSR. Further research could identify factors that motivate Vietnamese SMEs to fulfil their social responsibilities as well as to determine the impact of CSR on the business performance.

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Family Business Succession: Does Experience Gained in Family Firm Really Count?

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Potential family business successors have to resolve a complex trilemma when choosing their career path. Instead of choosing between the entrepreneurship and employment, they have to consider family business succession as an additional option. GUESS 2014 survey, conducted among more than 109.000 students in 34 countries, offered us the possibility to investigate the correlation between successors' career choice intentions and personal motives, family business experience and individual entrepreneurial skills. We analysed the data using multinomial logistic regression since career decision is measured as a categorical dependent variable with three possible solutions. We founded a significant correlation between personal motives and career decision. Similarly, the age at which potential successor was engaged in family business activity significantly influences his or hers career choice intention. On the other hand, we found that the length of engagement is not a significant factor. The higher level of self-assessed entrepreneurial skills is working in favour of succession when compared with employment option.

Key words: Family business, succession, career decision, skills, entrepreneurial education, feelings

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Introduction

Family business vision of long term, trans-generational growth of family firm and wealth, is the main distinguishing factor between family and nonfamily firms (Zellweger et al. 2012). Succession process appears to be one of the most important issues for assuring that growth from the viewpoint of continuation and sustainability of the on-going business. We know several different cases, which show us that it is very hard to predict family business future. We heard for

Kong' Gumi, a factory, which was absorbed by a multinational company in 2006 after successfully running the business within the family for about 1.400 years. On the other hand, we know that only one third of family firms survive the first transition and poor 10% the second nowadays (Le Breton-Miller, Miller, and Steier 2004). There are many reasons for that and they vary substantially with time, personal values and environment. That is why continuous research in the field of succession proves to be fundamental for the theory and practice of family business.

Successors, without any doubt, have and should continue to have one of the main roles in transition processes. They are usually confronted with a specific trilemma when deciding for the future career path, since they have an additional option comparing to their peers. They can seek for a job, start a new venture as an entrepreneur or take the responsibility for family firm future as a successor, both in the role of manager and/or future owner of the business. Previous studies identified various factors influencing the potential successor's career decision process. However, there are several gaps in deeper understanding the career intention of family business heirs. There is a traditional belief that they will join the family business and, sooner or later, take it over.

Still, potential successor is confronted with very hard decisions when it comes to choosing the career path. Today, young people are overexposed to many socio-economic factors in dynamic and constantly changing environment. In the parallel, they are frequently confronted with the lack of parental influence, due to lack of time. Given the importance and economic relevance of family businesses for any national economy, it is crucial to understand the communication gap, which results from described situation. This challenging topic was addressed by some recent papers which investigated several determinants of potential successor's career choice intentions (De Massis, Chua, and Chrisman 2008; Zellweger, Sieger, and Halter 2011; Altinay et al. 2012; Claire and Perryman 2016; Farrukh et al. 2017; Murphy and Lambrechts 2015). Young people are an important part of human capital in the country or in the business. Since human capital consists of knowledge, education, qualifications and skills it is created through education and improving professional skills, with consideration of work culture, psychological characteristics and physical conditions (Dorożyńska and Dorożyński 2015).

Our research has an ambition to build the multilevel model with the goal of explaining and predicting career choice intention based on important individual motives, experience in family firm and self-

assessed entrepreneurial skills. We rely on a massive database from the international GUESS 2014 (Global University Entrepreneurial Spirit Students' Survey) survey which allowed us to test the model on multinational level. Our main purpose is to test the influence of family business experience on heir's career decision taking into account personal motives and entrepreneurial skills perception. The study provides a better insight into the family business dynamics and intra-family relations in the context of succession process. We also base our study on recent calls for additional research focused on broader understanding of the area specially employing multi-country samples and considering type of business to be started (e.g. new own business or family business in our case) (Zapkau, Schwens, and Kabst 2017).

Theoretical Background

Family business tends to be a very volatile structure based on two important systems: family and business. These two systems have different boundaries, rules and individual roles but they are still interconnected. The inclusion of family and family members' relations makes family businesses different when compared to nonfamily owned firms (Eddleston, Kellermanns, and Sarathy 2008). Previous researches confirmed that there was a significant correlation between family and family business. Family business which gives more to family and business duality and correlation has better family and business results (Basco and Rodríguez 2009). Family support by itself significantly influences children's entrepreneurial intention (Shen, Osorio, and Rutgers 2017).

Each family member's identity is partly defined by his relationship with the family business (Kleiman and Peacock 1996). This relationship may be influenced by many different personal, business, environmental or economic factors. Several impacting factors are found to influence the family business transition process in the time gap between heir's education and career decision making. Some of such factors are: social capital, gender, economic situation, historical background, personality, attitudes, experiences and parental role model (Tarling, Jones, and Murphy 2016). Family business background has a positive impact on entrepreneurial intentions (Farukh et al. 2017). Children with entrepreneurial parents are more inclined to follow an entrepreneurial career (Carr and Sequeira 2007). Next generation family members need to find balance between their own personal career interests and aspirations, family interests and orientations and employment opportunities (Schröder and Schmitt-

Rodermund 2013). In this position, family business long-term well being may prevail over their personal career preference (Murphy and Lambrechts 2015).

Parents as role models provide opportunities for their heir's to learn from their experiences (Bandura 1977; Altinay et al. 2012). They can also alter the learning environment and increase entrepreneurial motivation among their children. Individuals are believed to gravitate towards the role models with the goal of gaining higher level of knowledge and skills (Gibson 2004). Previous research confirmed that student whose parents have started a family business and have been successful, have a significantly higher entrepreneurial intentions, compared to their peers (Ozaralli and Rivenburgh 2016). Early exposure to parental role models, which is an everyday common situation in family business, positively influences children's attitude towards self-employment (Chlosta et al. 2012). Parental entrepreneurial role models and positive family business experience generally nurtures the heir's self-confidence and reduces traditional fear from failure (Bosma et al. 2012). It also significantly increases heir's entrepreneurial ambitions (Altinay et al. 2012). Beside business related knowledge, entrepreneurial family members equip potential successors with business skills necessary for successfully running the family firm (Nicolau et al. 2008). Still, we have to mention that other researchers did not encounter any positive correlation between heir's exposure to family business and attitude towards self-employment (Kim, Aldrich, and Keister 2006). Novel studies of the specific field are obviously necessary. Researchers already called for further exploration of family dynamics influence on family member's career decision making (Aldrich and Cliff 2003).

Another key factor in encouraging entrepreneurship is awareness of entrepreneurs in local community. Recent studies showed that student population is decidedly unaware of their local entrepreneurial community (Claire and Perryman 2016). This finding is particularly important for college students who are in critical phase of forming their career decision. Active involvement in family business surely contributes to this awareness. Previous studies found that family members are most strongly involved as young individuals (Klyver 2007). Entrepreneurial education is another contributing factor in this context since it influences entrepreneurial intentions mostly indirectly through improving students skills, need for achievement, risk taking propensity, creativity and other entrepreneurial characteristics (Kusmintarti et al. 2016).

In our research we focused on personal traits processed in GUESS 2014 study, which could partly be shaped by the family-business relationship and heir's exposure to family business. Personality traits are known to be relevant factor for entrepreneurial intentions (Ozaralli and Rivenburgh 2016). Our paper contributes to the research in the field of family business succession by investigating a specific group of students with family business background and by modelling their career decision with the desire for independency, entrepreneurial skills and exposure to family business. We designed two models for two different time periods. Relying on the results of previous studies, which confirmed that family members want to learn from family firm before starting their own business (Tarling, Jones, and Murphy 2016), we observed heir's career choice immediately after their studies and five years after that. This approach is appropriate having in mind that based on actual career decision research, potential successors who put their own career on hold at the cost of helping family business, fulfilled their goals at later stage of life (Murphy and Lambrechts 2015).

Helping the family inevitably shortens the time spent outside family and family firm. Consequently, adolescents spend less time socializing with their peers. On the other hand, these adolescents can develop important entrepreneurial and general life skills and establish themselves as valued members of society (Fuligni and Telzer 2013). The sense of obligation to the family has implications in adulthood which makes potential heir's decisions more difficult. This naturally engrained act of helping the family is very specific in the context of family firm. It differentiates potential successors from their peers and is still relatively unexplored (Murphy and Lambrechts 2015).

Hypotheses Development

Among Kolvereid's (1996) factors which are motivating individuals for self-employment (economic opportunity, autonomy, authority, challenge, self-realization and participation in process), we detected two personal factors, which may be shaped by family relations. Those are autonomy and self-realisation. Both factors are important motivators, frequently given as a reason for starting a new venture (Kolvereid 1996). People often start businesses to achieve autonomy. Almost all small business starters expose autonomy as an important factor for their career decision. The firm could be seen as an instrument for achieving that goal (van Geldern and Jansen 2006). Even more, some studies control groups which con-

sisted of non-entrepreneurs, also gave same value to autonomy as nascent entrepreneurs (Carter et al. 2003). Self-realization, as another influencing factor, is understood as the pursuit of goals that are of interest to the entrepreneur (Edelman et al. 2010). Self-realizer is a person who lives creatively and fully uses his potential (Maslow 1954). This definition was also adopted and used in previous research where it was interpreted as transformation of opportunities into the reality (Maksimenko and Serdiuk 2016). Acting on the basis of self-realization values is influenced by feeling of personal expressiveness. As such, self-realization contributes to intrinsic motivation and is correlated with perceived competence (Waterman et al. 2003). Self-realization is also linked with the need for self-improvement or achievement and represents an important motive for entrepreneurial behaviour (Barba-Sánchez and Atienza Sahuquillo 2012). The need for achievement is one of the most powerful motivational factors within the domain of personal traits related to entrepreneurship (Altinay et al. 2012). Previous studies confirmed that significantly more start-ups are realized by individuals whose valence for entrepreneurial career is based on self-realization rather than financial success (Renko, Kroeck, and Bullough 2012).

- H1 *Higher level of perceived importance of autonomy result in preferring founding own new business over the succession and succession over the employment (Kolvereid 1996; van Geldern and Jansen 2006).*
- H2 *Higher level of perceived importance of self-realization result in preferring founding own new business over the succession and succession over the employment (Kolvereid 1996; Waterman et al., 2003).*

Entrepreneurs often share family business background. Prior family business experience affects future generations in many ways (Dyer 1992). Their entrepreneurial attitudes and behaviours may be positively or negatively shaped towards business ownership (Carr and Sequeira 2007). Parental work experiences for example, have significant influence on children. These influences may be internalized in a form of norms or children's future behaviour (Menaghan and Parcel 1995). Some previous pieces of research correlate these findings with family business, namely by confirming that early exposure to entrepreneurship and experience in the family business will affect family member's entrepreneurial intentions and attitudes in the future. Many entrepreneurs confirmed their prior direct exposure to family business in their young age (Dyer and Handler

1994). Early socialization in a family business is recognized as an influential factor, which influences the formation of individual's entrepreneurial values and attitudes (Light and Bonachich 1991). Early exposure to family business also builds positive entrepreneurial values and beliefs which are lasting and impacting (Tarling, Jones, and Murphy 2016). Potential successors are involved with the family business in their young age through the activity of helping. This represents an important part of their career exploration during childhood which further relates to exploratory behaviour during adolescence (Murphy and Lambrechts 2015). Length of exposure to family business (working for family firm) may as well be a significant influential factor when time comes for a career decision (Morris, Williams, and Nel 1996). Since career exploration is related to career decision making, family members who are involved in family business for a long period of time, without exploring other career opportunities, may limit their choices in critical period (Schröder and Schmitt-Rodermund 2013).

H3 *Older the heir is when exposed to family business for the first time higher is the preference for employment or founding own new business over the succession (Dyer and Handler, 1994).*

H4 *Longer exposure to family business leads to preferring family business succession over employment and founder career alternatives (Carr and Sequeira 2007; Morris, Williams, and Nel, 1996).*

Another factor, which importantly influences the succession process and successor's career decision as a crucial part of it, is heir's ability to take the control over family firm. Successor's business skills play an important role since lack of skills may easily lead to the refusal of the position (De Massis, Chua, and Chrisman 2008). Previous studies among students deriving from family businesses showed that offspring's intention to join the family business is significantly related to individual skills and abilities (Stavrou 1999). In their study, Morris, Williams, and Nel (1996) also concluded that heir's formal level of education and training as well as self-perception of his or her preparation level at the time of succession has a significant influence on the succession process itself. In this context, the concept of entrepreneurial self-efficacy should be mentioned, especially in relation to heir's level of education and skill training, which should concentrate more on capabilities like innovation and risk-taking management and less on technical entrepreneurial skills (Chen, Greene, and Crick 1998). Recent studies confirmed a positive relationship be-

tween self-efficacy and entrepreneurial intention since individual's belief on his or her abilities positively affects the entrepreneurial intention (Farrukh et al. 2017; Owoseni 2014).

All these factors are contributing to the positive image of the family firm in the eyes of the heir. The succession process is generally more likely to succeed if children have a positive image of the family firm. In such case, participation in family business is viewed more as an opportunity and not that much as an obligation. With the goal of long term survivor, family business has to produce motivated heirs with highly developed entrepreneurial skills (Kleiman and Peacock 1996).

H5 *Students with more positive perception of their own entrepreneurial skills will prefer founding own new business over the succession and succession over the employment (De Massis, Chua, and Chrisman 2008; Morris, Williams, and Nel 1996; Stavrou, 1999).*

Methods

Our data originates from GUESS 2014 survey data collection with around 109,000 student respondents from 34 countries. The survey collected data anonymously on-line. With the goal of preventing multiple responses bias we used IP identification based questionnaire. In the absence of general family business definition we relied on the definition of Barnes and Hershon (1976) according to which the majority of shares in family business is owned by one or more members of the same family. Consequently, 23,485 European students with family business background from 18 countries were sampled from data set (Great Britain, Germany, Luxemburg, Netherlands, Switzerland, Austria, Belgium, Denmark, Spain, Finland, France, Italy, Portugal, Slovenia, Romania, Poland, Estonia and Hungary).

Respondents were answering direct questions about the possible ownership of mother, father or both parents. Students, with family business background, who already owned their own business, were also excluded from the study, since they could have been a potential source of survivor bias in retrospective studies (Davidsson 2004; Gartner 1989). Our respondents were asked about their career choice immediately after their studies and five years after that period. They had four possibilities to choose from: 'an employee', 'an entrepreneur', 'a successor' or 'I don't know yet'. The option 'I don't know yet' allowed avoiding forced decisions. Only student with family business experience are included in the study. After all necessary

TABLE 1 Sample Structure

Item		Immed. after studies		5 years after studies	
		<i>n</i>	%	<i>n</i>	%
Career choice	Employee	3450	85.9	1660	45.9
	Founder	268	6.7	1444	39.9
	Successor	298	7.4	515	14.2
Gender	Man (ref)	1763	43.9	1599	44.2
	Woman	2253	56.1	2020	55.8
Entrep. education	No (ref)	1844	45.9	1689	46.7
	Yes	2172	54.1	1930	53.3
Valid		4016	100.0	3619	100.0

reductions 4,016 students were included in the study for the period immediately following their studies and 3,619 students for the period of five years after finishing their studies. The number of participants differs due to undecided individuals, which were excluded. The principal demographics and responds about basic career intentions are displayed in table 1.

Since our dependant variable is categorical with three possible solutions (employee, founder, successor), we used multinomial logistic regression, which we found as the most appropriate statistic method. In our paper we investigate succession so it is always the reference category when interpreting our regression results. We constructed two regression models. One for the period immediately after finishing the study and one for the period five years after finishing the study. The second option is forcing respondents to concentrate on both periods precisely when answering (Zellweger, Sieger, and Halter 2011). Besides, an entrepreneur typically works elsewhere for five years in average, before engaging in a new start-up (Brockhaus and Horwitz 1986).

Our first two independent variables are autonomy (three items: 'freedom', 'independence' and 'to be your own boss') and self-realization (three items: 'to realize your dream', 'to create something' and 'to take advantage of your creative needs'). Both are captured using 7-point Likert scale. We used items already tested in some earlier studies (Souitaris, Zerbinati, and Al-Laham 2007). We measured self-assessed entrepreneurial skills as our third independent variable using 8 items. Students indicated their level of competence in performing eight entrepreneurial tasks: (1) identifying new business opportunities; (2) creating new products and services; (3) applying my personal creativity; (4) managing innovation within a firm; (5)

TABLE 2 Pearson Correlations: Immediately After Studies

Item	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1)	1	-0.022	0.036*	0.038**	-0.037*	0.039**	-0.029	0.037*	-0.044**
(2)	-0.022	1	0.448**	-0.128**	0.324**	0.024	0.015	0.167**	0.198**
(3)	0.036*	0.448**	1	-0.143**	0.370**	0.054**	0.009	0.125**	0.128**
(4)	0.038**	-0.128**	-0.143**	1	-0.210**	-0.056**	-0.023	-0.038*	-0.108**
(5)	-0.037*	0.324**	0.370**	-0.210**	1	0.013	0.065**	0.197**	0.152**
(6)	0.039**	0.024	0.054**	-0.056**	0.013	1	-0.250**	-0.097**	0.033*
(7)	-0.029	0.015	0.009	-0.023	0.065**	-0.250**	1	0.179**	0.097**
(8)	0.037*	0.167**	0.125**	-0.038*	0.197**	-0.097**	0.179**	1	0.164**
(9)	-0.044**	0.198**	0.128**	-0.108**	0.152**	0.033*	0.097**	0.164**	1

NOTES Column/row readings are as follows: (1) gender, (2) autonomy, (3) self-realization, (4) entrepreneurial education, (5) skills, (6) age working for FB, (7) time working for FB, (8) feelings toward FB, (9) career decision.

TABLE 3 Pearson Correlations: Five Years After Studies

Item	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1)	1	-0.009	0.040*	0.025	-0.031	0.042*	-0.020	0.035*	-0.060**
(2)	-0.009	1	0.451**	-0.124**	0.326**	0.026	0.011	0.167**	0.272**
(3)	0.040*	0.451**	1	-0.139**	0.367**	0.058**	0.006	0.132**	0.166**
(4)	0.025	-0.124**	-0.139**	1	-0.202**	-0.056**	-0.024	-0.042*	-0.116**
(5)	-0.031	0.326**	0.367**	-0.202**	1	0.020	0.058**	0.200**	0.225**
(6)	0.042*	0.026	0.058**	-0.056**	0.020	1	-0.248**	-0.076**	0.047**
(7)	-0.020	0.011	0.006	-0.024	0.058**	-0.248**	1	0.175**	0.050**
(8)	0.035*	0.167**	0.132**	-0.042*	0.200**	-0.076**	0.175**	1	0.235**
(9)	-0.060**	0.272**	0.166**	-0.116**	0.225**	0.047**	0.050**	0.235**	1

NOTES Column/row readings are as follows: (1) gender, (2) autonomy, (3) self-realization, (4) entrepreneurial education, (5) skills, (6) age working for FB, (7) time working for FB, (8) feelings toward FB, (9) career decision.

being a leader and communicator; (6) building up a professional network; (7) commercializing a new idea or development; and (8) successfully managing a business. The eight items were developed from previous studies of self-efficacy and innovation (Chen, Greene, and Crick 1998; Zhao 2005; Kickul et al. 2009; DeNoble, Ehrlich, and Singh 2007). The measuring scale was from 1 (very low competence) to 7 (very high competence). Our fourth and fifth independent variables are continuous since students were directly asked when (at what age) and for how long (in months) they had been actively engaged in family business.

We introduced three control variables in the model: gender, entrepreneurial education and positive or negative feelings towards

family business. Gender and entrepreneurial education are introduced as categorical values. Participants were asked if they have attended at least one subject, which included entrepreneurial theory and/or skills. We captured students feeling towards their family business with five items measured using 7-point Likert scale (attachment, feelings, tradition, importance of keeping the firm in the family and having a deep insight into business).

Pearson correlations results are shown in tables 2 and 3. Since all correlations are well below the marginal value of 0.6, shared variance is not the problem (Hair et al. 2010). We calculated variance inflation factor (VIF) for each independent variable. It never exceeds 1.4 which is well below the marginal value of 3.0 and it is safe to expect that multicollinearity does not seem to be a problem in our model (Hair et al. 2010). Our independent variables are confirmed to be empirically distinct since one factor solution from Harman's single-factor test accounted for 33.59% of total variance. As such, it didn't reach the threshold of 50% (Hair et al. 2010).

Results

Our regression model results for both periods observed are presented in table 4. Looking at motivational factors included in the model, we may conclude that higher level of craving autonomy leads more to succession compared to employment. Calculated coefficients are noticeably high for both periods ($B = -0.463$ and $B = -0.353$). We also see that students intend to engage into a new start-up rather than taking over a family firm ($B = 0.009$ and $B = 0.197$). Relying on this conclusions we can confirm our first hypotheses for both investigated time-periods. The motive of self-realization results in slightly differentiated picture. We can completely confirm our second hypotheses for the period following immediately after studies, since potential heirs with higher desire for self-realization will prefer to continue family business tradition rather than find an employment ($B = -0.049$). On the other hand, they also prefer a new start-up to succession ($B = 0.127$). For the period of five years after finishing their studies, the participants prefer both alternatives over the succession ($B = 0.100$ and $B = 0.388$). This only partly confirms our second hypotheses which claimed, that higher level of perceived importance of self-realization result in preferring founding own new business over the succession and succession over the employment.

The older the heir is when firstly exposed to family business experience, the higher is the probability for succession career decision

TABLE 4 Regression Models Results

Model coefficients		Immed. after studies		5 years after studies	
		<i>B</i>	Sig.	<i>B</i>	Sig.
Employee	Intercept	9.445	0.000	7.535	0.000
	Autonomy	-0.463	0.000	-0.353	0.000
	Self-realization	-0.049	0.471	0.100	0.048
	Skills	-0.145	0.043	-0.240	0.000
	Age working for FB	-0.054	0.002	-0.059	0.000
	Time working for FB	-0.009	0.000	-0.002	0.441
	Feelings toward FB	-0.403	0.000	-0.549	0.000
	Gender (mail)	-0.249	0.048	-0.368	0.001
	Entrep. education	-0.448	0.000	-0.201	0.064
Founder	Intercept	1.183	0.151	0.316	0.517
	Autonomy	0.009	0.926	0.197	0.001
	Self-realization	0.127	0.195	0.388	0.000
	Skills	0.149	0.136	0.095	0.118
	Age working for FB	-0.052	0.026	-0.036	0.019
	Time working for FB	0.001	0.840	-0.001	0.659
	Feelings toward FB	-0.435	0.000	-0.524	0.000
	Gender (mail)	0.057	0.741	-0.120	0.264
	Entrep. education	0.092	0.605	0.304	0.005

compared to both other alternatives in both periods, which we observed ($B = -0.054$; $B = -0.052$; $B = -0.059$; $B = -0.036$). Based on these results, we can completely reject our third hypotheses based on which, older the heir is when exposed to family business for the first time, higher should be the preference for employment or founding own new business over the succession. Highly significant results in this part surprised us, since they seem to oppose general believe that exposure in younger age positively influences succession intention.

We found out that duration of an active exposure to family business does not have any significant influence on heir's career choice. Our results are not statistically significant, with the exception of coefficient, which is defining the correlation between succession option and the employment alternative. The longer the time of involvement in family firm, the higher the possibility for succession compared to employment straight after the studies are completed ($B = -0.009$). We can confirm only this part of our fourth hypothesis. Still the values of all coefficients, including the one mentioned above, are very low ($B = -0.009$; $B = -0.002$; $B = 0.001$; $B = -0.001$). As such, they

have a low impact on the career decision in our model (dependant variable).

In both periods, students with higher developed entrepreneurial skills prefer to take over family business if confronted with employment alternative ($B = -0.145$; $B = -0.240$). They also prefer starting of a new company to succession ($B = 0.149$; $B = 0.095$). Still, we have to emphasize that our results are not statistically significant when comparing founder and successor career opportunities. Due to this fact we can only partly confirm our fifth hypothesis according to which students with more positive perception of their own entrepreneurial skills should prefer founding own new business over the succession and succession over the employment.

Measuring feelings towards family business ended up with highly statistically significant results. Like expected, students with family business background and higher level of positive feelings towards family firm, will prefer succession career to both alternatives ($B = -0.403$; $B = -0.549$; $B = -0.435$; $B = -0.524$). Model coefficients are very high in this part, which indicates that this variable should be a part of similar models when investigating career decision process.

Our control variable for gender emerged as statistically significant when comparing employment career with succession alternative. Male students, compared to females, will more likely choose succession over employment in both observed time-periods ($B = -0.249$; $B = -0.368$). We detected a difference when comparing founder and succession alternative, yet without statistically significant results. Males, compared to females, will more likely start-up a new company than take over a family business in the period immediately after their studies ($B = 0.057$). Five years after that, males will more likely choose succession over foundation ($B = -0.120$).

Students without any kind of entrepreneurial education will prefer succession career to employment in both observed periods. Coefficient is high ($B = -0.448$) and highly statistically significant ($p < 0.001$) for the period immediately after studies. Regardless the lack of entrepreneurial education, they will also rather choose to start-up a new company despite the opportunities they could have in family firm. The coefficient is noticeably high ($B = 0.304$) and statistically significant ($p = 0.005$) for the period five years after the studies.

Discussion and Implications

Our paper contributes to explaining and better understanding the career trilemma which stands in front of students with family business background upon finishing their studies. We investigated career

decision patterns of students in European countries in relation to motivation for autonomy and self-realization, entrepreneurial skills and exposure to family firm in the form of active involvement. With some very interesting results, we believe that the study substantially upgrades family business succession literature and gives some new perspectives and guides for future researches of career decision making process. Our study differentiates entrepreneurial intention from family business succession intention. As such it follows the calls for closing the research gap on this area (Zapkau, Schwens, and Kabst 2017).

Potential heirs, driven by high level of autonomy motive will definitely choose succession rather than employment career. Despite frequently mentioned potential obstacles from the parent's side, they still feel they can be more autonomous in family firm than elsewhere if they take the role of an employee. This finding is in line with previous research results which claimed that family support significantly influences children's entrepreneurial intention (Shen, Osorio, and Rutgers 2017; Farrukh et al. 2017). We also saw that immediately after the studies, they don't make a difference between level of autonomy gained as a successor or as a founder. Five years later they will prefer to start-up a new business instead of succession. We could speculate that they are willing to try for a few years and check if they can reach desired level of autonomy within family firm. This line of conclusion adequately follows previous studies which founded out that family members want to learn from family business before starting their own firm (Tarling, Jones, and Murphy 2016). The motive of self-realization gave us similar results. We detected a different result only when comparing employment and succession alternatives five years after the study. Students with stronger desire for self-realization would find a job rather than take over a family business in that period. It is possible that the reason for this is gaining experience in stable environment provided inside a family business. After obtaining the adequate knowledge and skills, heirs will seek self-realization opportunities elsewhere as employees or with new start-ups, which confirms the results from previous studies (Murphy and Lambrechts 2015; Tarling, Jones, and Murphy 2016). These findings should serve as guidelines for parents when planning a succession process. Both motives emerged as very important in the decision making process, so parents should carefully consider how to make it possible for children to reach their goals.

Our results show that the older the heir is when actively engaged into family business, the more probably he/she will decide for a suc-

cession career compared to both other career alternatives (employment or new start-up). This finding is, by all means something to think about since it doesn't support previous findings which claimed that early exposure to experience in family business will affect family member's intentions and attitudes (Dyer and Handler 1994) and, that family members are most strongly involved as young individuals (Klyver 2007). It does still however support previous findings that early socialization in family firm forms individual's entrepreneurial values and attitudes (Light and Bonachich 1991). Our result is also supporting the fact that helping in family firm develops important entrepreneurial and general life skills (Fuligni and Telzer 2013). We can't say that our finding completely opposes to previous researches since the design of our study was driven by existing data set and results we provided are not directly comparable with previous studies. However, we think that our paper indicates the necessity for further research of the topic similarly like some other recent studies concluded (Murphy and Lambrechts 2015).

Based on previous studies, researchers expected that length of exposure to family business may significantly influence career decision (Morris, Williams, and Nel 1996). Our study importantly contributes to this specific question by resulting with negative answer in case of students with family business background. We still have to keep in mind, that we are investigating a very narrow group of young people confronted with a specific trilemma. Yet, our results are very clear. The length of engagement in family firm doesn't affect heir's career decision. Our conclusion is in line with previous studies which concluded that long period of involvement in family business may limit career choice opportunities in critical period (Schröder and Schmitt-Rodermund 2013). This finding represents a useful and practical guideline for parents and educational institutions. It is important to gain some experience, however, longer experience does not necessarily affect future career decision. Exposure to family business is something that seems to occur spontaneously when speaking about potential heirs. This fact may also represent a pleasure since long-term well being of family business may oppose to heir's personal interests (Murphy and Lambrechts 2015). Our findings indicate that this is not likely to be a considerable problem for career decision making process at least when we analyze the length of active engagement (working for family firm). There are other influential factors, to which a potential heir is constantly exposed in family with family business, like lack of parental time, exposure to business problems, parental stress and many more. In our

opinion, these factors should be precisely modelled in future studies. From the implication perspective our result implies that it is very important to include potential successor as much as possible into family business during the period of heir's university study. In our opinion entrepreneurial parents should follow this guideline regardless the amount of previous successor's engagement in the family firm.

Previous researchers already confirmed the correlation between entrepreneurial skills and self-competence (Morris, Williams, and Nel 1996; Farrukh et al. 2017). We can confirm that higher level of entrepreneurial skills surely gives stronger feeling of self-competence which further results in preferring succession to employment and a new start-up to succession. This is an expected result which confirms existing concepts and previous findings (Chen, Greene, and Crick 1998; Farrukh et al. 2017). It is of great importance for parents, educational institutions and governments providing support environment for businesses. Our control variable which included entrepreneurial education in the model, gave similar results, which is also expected. Nowadays, when we have already recognized the importance of SME for national economy, it is crucial to provide high level of entrepreneurial knowledge and skills to young generation. It is of the best interest of all parties. Parents may think, that providing more knowledge and developing entrepreneurial skills will lead heirs to select a, for them unwanted, independent path but this is not necessarily true. In our opinion, it is crucial to recognize that not developing entrepreneurial skills is surely the least desirable choice. There are many factors influencing potential heir's career decision. Highly developed entrepreneurial skills should be recognized as a precondition and shouldn't be used as a tool for influencing heir's decision. However, parents should become aware of the results of this study and try to gain children's confidence and affection for family firm using other methods, since their goal should always be to assure the long-term survival of a family firm.

Continuing our thinking from previous paragraph, we should have a look at feelings towards family business. In our model this variable reached highly statistical significance in favour of family business. It may well be one of the important tools for gaining heir's affection mentioned beforehand. This result is in accordance with naturally engrained need for helping the family, which has significant implications for career decision according to previous studies (Murphy and Lambrechts 2015). Building positive feelings towards family business should be a continuous process. Parents, as role models, surely have the main role in this process. Having in mind our previ-

ously discussed results about the age of heir's engagement into family business, parents should know that it is never too early and it is never too late. They should start involving young children in family business as soon as possible and they should never stop until career decision is already, not only made, but implemented.

When observing entrepreneurial education, we learned that entrepreneurial education doesn't increase the entrepreneurial intention level. This finding is in line with previous studies which confirmed that entrepreneurial education by itself is not a sufficient influencing factor. It has to be understood more as a mediating factor which influences personal traits and psychological characteristics of an individual (do Paço et al. 2015). Similarly, Kusmintarti et al. (2016) confirmed that entrepreneurial education is an indirect factor which influences student's entrepreneurial skills, risk taking propensity and creativity.

Limitations of the Research

Our research is partly limited by the fact that we used an existing dataset. This disabled us to design a model which could be more comparable with the results of previous studies. GUESSS survey used self-assessed measures, which is much easier and cheaper method for gaining information but could be biased. However, we limited this problem by using multi-item Likert scales and by guaranteeing strict confidentiality to our participants.

The study is also limited by the fact that GUESSS survey doesn't provide information about job access, which could be a factor influencing heir's career decision. This is the main reason why we limited our study to European countries where we expect comparable conditions regarding the issue all over the region.

Future Studies

Our study significantly advanced the understanding of successor's previous entrepreneurial engagement in family firm influence on his or her entrepreneurial intention but still left opened some important questions linked to family business succession process. The age and the length of potential heir's active involvement into family business as well as informal exposure to family business environment should be investigated using more complex models. Further studies should strive for better explaining the influential factors, deriving from family environment in one general multilevel model. Our suggestion is further grounded by the fact that feelings towards family business variable emerged as highly significant in our model.

Since some of our results are in conflict with previous studies, we recommend replication studies with the goal of resolving these conflicts. Future studies should put a stronger emphasis on the specific trilemma confronted by the students with family business background and clearly distinguish between new start-up and succession direction within entrepreneurial career possibilities.

With further qualitative research the reasons behind the influence of different variables on target group career choice intentions should be analyzed. Qualitative studies do not allow establishing significant influences but they do offer a possibility of better understanding the family business environment which makes potential successor career decision more complicated. This kind of qualitative research could be used as a base point for building a much more predictive multilevel quantitative model targeting the issue of succession. Future researcher should also consider analyzing different geographical regions and cultural environments.

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Improving Direct Marketing Activities Effectiveness Using Analytical Models: RFM vs. Logit Model on a Casino Case

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This research deals with the development and implementation of a large-scale analytics framework for improving segmentation and targeting of a service firm's direct marketing activities. The aim of the framework is to create a direct marketing response model using customers' demographics and other behavioural data (such as past response to direct marketing activities) from a casino (gambling industry). Prior to this research the company was using Recency-Frequency-Monetary (thereafter referred as RFM model). The statistical model used in our research, based on logit regression, significantly improves the accuracy of direct marketing activities as well as provides insight on relevant customers' characteristics that affect choice. We believe the results are a show-case of combining large, disaggregate, individual-level datasets with marketing analytics solutions for improving response to the marketing-communication mix. As per our knowledge in the time of writing this paper no such complete set of demographical and behavioural determinants have been used in direct marketing effectiveness analysis in the casino industry. Findings in this paper can be used by the company to considerably improve fine-tuning of target segments in their direct marketing activities, other industries (currently using RFM for direct marketing activities target group selection) can also benefit.

Key words: direct marketing effectiveness, RFM, logit modeling

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Introduction and Theoretical Framework

Direct marketing activities, when not correctly targeted, can have higher than necessary cost turning an otherwise profitable promotion activity into a loss. A variety of direct marketing optimization

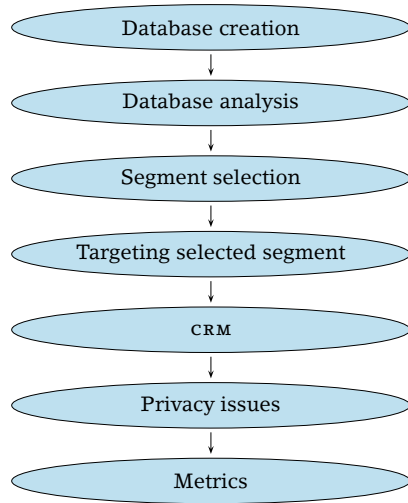


FIGURE 1
A Model of Customer
Relationship Management

models have been developed in the past helping target profitable current and potential customers (Bult and Wansbeek 1995; Shepard 1999; Malthouse 2001). With recent greater emphasis on importance of customer relationship management from academia and practitioners and increased availability of large quantities of data (due to gains informatisation technology and associated statistical methods) the development of such tools has been accelerated producing a wide set of useful tools. A theoretical model of CRM has been introduced by Winer (2001) and is represented in figure 1.

Winer argues that ideal datasets should include customer's purchase history, sales person contact with the single customer, customer demographics and his responses to different marketing activities (Winer 2001, 92). The process of CRM can be monetarily expressed with Customer Lifetime Value (thereafter as CLV) which calculates the forecasted discounted net cash-flows a customer creates to the company and where the sum of all customers' LVs is defined as Customer Equity (Wierenga 2008, 292). It is in this (long-term) perspective that a company should view its cost associated with acquiring new customers (and not through a single transaction). Most companies decide on running a CRM program based on the assumptions that a segment exists that is ready and willing to tighten its bonds with the company to establish a permanent relationship based on loyal purchases, that these customers are highly profitable and that a company can affect their loyalty through various approaches (Musek Lešnik 2008, 142). Such activities aim to increase consumers'

loyalty, increased frequency and monetary value of transactions as well as creating positive attitudes towards the company and/or its brands (Sharp and Sharp 1997, 474). Several strategical and tactical activities follow the concept of CRM. One can find related topics in every CRM literature.

Critics of loyalty programmes argue that their high cost seldom create increased revenue, there is hardly any empirical evidence on increased consumption (and thus frequency). Wide spread of such activities dilutes their effectiveness, failure to convert non-users to users or increase loyalty within current customer base (Leenheer et al. 2007, 31).

Further increase of computing power and development of statistical tools have contributed to new (often real-time) data gathering called data mining, that involves searching for patterns in a large set of incomplete, unfiltered data. Data mining has more than once contributed to the development of unsought relationships resulting in breakthrough findings (Wang in Sing'oei 2013). Direct marketing analytics support has also benefited from data mining techniques (i.e. mass parallel processing or symmetric multi-processing; Churchill and Iacobucci 2002).

Overview of Existing Models for Measuring Direct Marketing Effectiveness

As mentioned earlier the most widely used model for optimal direct mail targeting is the RFM and its various modifications (Malt-house 2001). Bult and Wansbeek (1995) specify a profit function. By setting marginal costs equal to marginal revenues they determine which household should be receiving the offering. Improved RFM models namely AID (Automatic Interaction Detection) and CH-AID (Chi Square AID) (Kass 1976) have been proposed to cope with limited variables selection used by RFM (only Recency, Frequency and Monetary) by adding demographics. All these early models have arbitrarily determined factors. In late 80ties regression models with statistical started to emerge (i.e. general customer purchase model; Bauer 1988). A popular model from Bansalben (Nash 1992) – gains chart analysis is based on a three-stage process. The initial stage analyses the test mailing response from target population by means of regression analysis to determine how household characteristics affect response by giving each household a probability that in future they will respond to marketing activities. The next step orders the population by the factors derived in the 1st stage. Last stage consists in dividing households with similar index value into groups of equal

sizes and calculating the average response rate of the group. A cut-off point is arbitrarily determined and household above this point targeted.

Due to its ease of use, the RFM model is still being most widely used (Wollen 2017). Wheaton Group (see <https://www.wheatongroup.com>) argues that with increasing sizes of databases, RFM becomes inefficient and requires constant re-segmenting, especially in situations where a large heterogeneous group of products with different profitability are being offered. Our research shows how a casino (with a very large database of direct marketing events) can improve their targeting accuracy using multiple logit regression. A set of statistically relevant factors is also given (not possible with RFM). Profitability is not calculated in this paper but can easily be added to the model. With statistical tools available management can set-up a predictive tool in real time.

Research Set-up and Dataset

The objective of direct marketing models is to select a subset of the population that is going to receive a marketing communication with the aim of maximising client response and minimising cost. Thus, a direct marketing model must be able to predict the client response to the received offer based on the data that the company has gathered about the client (Taghva, Bamakan, and Toufani 2011). One of the most widely used segmentation methods for direct marketing support is the RFM analysis for clustering (Aggelis and Dimistris 2005). RFM is a classifying mechanism based on three sets of factors, namely time since last purchase, frequency of purchases and average value of purchase. Every customer is given a score upon which his participation in the next direct marketing campaign is based (Hosseini, Maleki, and Taghva 2010). RFM assumes that higher ranking customers are more responsive to direct marketing activities and that there is increased probability they would buy (Yeh, Yang, and Ting 2009) There are several versions of setting the three grouping factors levels. The most commonly used is a 5 levels/dimension, resulting in 125 segments (Olson and Chae 2012).

The expected contribution of a customer is $\mu_i\pi_i$, where μ_i represents the expected sales from customer i and π_i is the probability that the i customer will respond to the communication.

A customer is profitable when $\mu_i\pi_i > c_i$, where c_i is the projected cost for sending the message through to the customer i .

RFM has several flaws, mostly originating from its arbitrariness when selecting segment's criteria. It fails to predict the expected

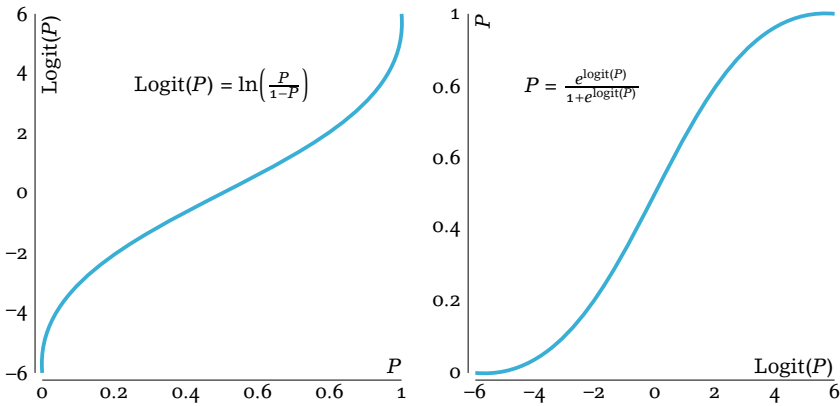


FIGURE 2 Logit Regression S-Shape Curve

number of buying customers in the future, it needs to be adjusted to specific industry needs and requires repeated trial-error fine tuning. To address some of the RFM disadvantages (mainly arbitrariness when selecting weights for the three criteria groups) we apply logistic regression on sample data from a service industry (gambling) and compare it with the current RFM model they are using to assess their direct marketing effectiveness.

Logit (or probit) regression analysis has been widely used in marketing research. Its main advantages are conceptual simplicity, it analytically defines weights (importance) for different criteria as opposed to RFM arbitrariness (Coussement, Harrigan, and Benoit 2015) and it is faster (Simonof 2016).

The logit model is a S-shaped success probability regression model with discrete dependent and various independent variables. It is modelled as:

$$\ln \frac{p}{1-p} = \sum_{i=0}^n \beta_1 X_i \tag{1}$$

where p represents the probability of success and $\sum_{i=0}^n \beta_1 X_i$ the vector of independent variables. Solving for p we get the S-shaped curve (see figure 2):

$$p = \frac{e^{\beta_0 + \beta_1 x}}{1 + e^{\beta_0 + \beta_1 x}} \tag{2}$$

The regression is solved by using OLM or GLM. Regression coefficients are tested using Wald statistics, which has a chi-square distribution:

TABLE 1 Direct Marketing Activities

Month	2014		2015	
	(1)	(2)	(1)	(2)
January	22	SMS, e-mail	22	SMS, e-mail
February	30	mail	28	mail, SMS in e-mail
March	28	SMS, e-mail	23	SMS, e-mail
April			15	SMS, e-mail
May	27	SMS, e-mail	29	mail
June	29	mail	23	mail, SMS and e-mail
July	25	mail, SMS, e-mail	28	mail, SMS, e-mail
August			29	SMS, e-mail
September	25	SMS, e-mail	34	mail
October	28	mail	28	SMS, e-mail
Average	26.6		26.0	

NOTES Column headings are as follows: (1) response rate, (2) channel.

$$Wald = \left(\frac{\beta_i}{SE\beta_i} \right)^2. \quad (3)$$

By adjusting the used parameters in the set of independent variables used in the regression we can fine-tune our model and compare it to the currently used RFM techniques.

Data Set

Our data consists of a collection of 2 years direct marketing communications to 18.000 clients and including their responses. In marketing, such a large database of responses is rather exceptional than common. In our case it has been made possible by a law requiring compulsory registration of the customers at casino entrance and tracking of their activities (game play) in the casino.

We use a combination of demographical and behavioural variables as the independent set of variables. Response rate was roughly 25%. Table 1 shows types of communications per month and their response rates (there were no activities in November, December 2014 and September, December 2015).

The currently used RFM model classifies as potentially profitable (will probably engage in profitable activity for the casino after receiving the direct marketing communication) 25% of the customers base. Communication offers included a monetary value (to be spent in the casino), based on past expenditures and frequencies of visits. Some potentially profitable customers are filtered out due to incomplete data (missing address, phone number or e-mail). The

TABLE 2 Demographic Variables Descriptive Statistics

Factor		<i>N</i>	%
Gender	0 Men	10249	56.9
	1 Women	7751	43.1
Nationality	1 Slovenians	741	4.2
	2 Italians	14472	80.4
	3 Austrians	2108	11.7
	4 Chinese	566	3.1
	5 Other nationalities	113	0.6
Distance	1 Closer than 300 km	14077	78.2
	2 300 to 500 km	1873	10.4
	3 More than 500 km	2050	11.4

company distinguishes 3 segments of customers based on recency (undisclosed criteria):

- Regular customers,
- Revitalisation segment (customers that hasn't visited for a short period of time), and
- Lost segment.

The first two segments are further split into (based on frequency):

- Low frequency segment and
- High frequency.

The resulting segments are further split into 21 segments based on average game bet they did in the past (detailed data has not been disclosed by the company).

RFM does not measure which segments has responded better to the communication sent, although this could be done post fest, the company does not do this kind of analysis. The logit model focuses on demographical and behavioural (only used in RFM) characteristics of customers namely: gender, age, nationality, distance from casino (demographical variables), monetary value of offer, type of service, average spending on games, bet size, number of visits, channel of communication and percentage of past responses to direct communications (behavioural variables). The dependent variable is whether the offer sent was used or not. Tables 2 and 3 show descriptive statistics for independent variables.

The success rate was 29.7%. Beside conceptualizing the model, we have also tested some demographical/behavioural variables interdependency before constructing the logit model.

TABLE 3 Behavioural Variables Descriptive Statistics

Item	Average	SD	Min	Max
Age	54.80	15.50	18.00	98.00
No. visits	28.14	50.20	1.00	699.00
Total bet	109.00	404.00	0.60	28.15
Average bet	10.60	50.80	0.02	2314.00
Incentive sent through marketing	15.53	26.15	5.00	750.00
Percentage of responses	31.18	0.33		

NOTES $N = 18000$.

Initial findings show that women (playing automates) play statistically different games than men (playing at tables), there is a statistically significant correlation between age and number of visits per week ($r = 0.159$, sig. = 0.000) proving that elder people visit casinos more often. Not surprisingly, distance from casino affects the number of visits (group 1 – 0–300 km distance visited the casino 31 times in two years, group 2 – 300–500 km 17 and group 3 – above 500 km 18.5 times), although group 2 and 3 show adverse results. We attribute this to the fact that very distant high frequency/high monetary customers were transported free of charge to the casino. The average value played on machines was around 4 times smaller than at tables. While all nationalities show similar percentages of successful responses (from 30.4% for Slovenians to 34.7% for Austrians), Chinese exhibit only 12.1%. For the casino it would be worth researching further why. Response rates were 31% for e-mail and smss, while for classic mail they dropped to 15%. The latter is also the costliest way of distributing communication.

Results and Discussion

Our model was constructed using 2 steps. In the initial step we included all the demographical variables we had available. The 2nd model then only included statistically significant variables from the initial step. Nationality was recoded to (Italian/non-Italian) as this group represented 80% of the total sample. The initial model is shown in table 4.

Gender, nationality, game strength and past visits are not statistically significant. It is interesting that behavioural factors – number of visits and money spent do not affect direct marketing responses. This might suggest that there is a strong loyal customer base that ignores the incentives given by the casino.

This insight should be addressed by the casino when targeting customers to avoid giving incentives to those who would anyway be

TABLE 4 First Model Regression Coefficients

Item	B	SN	Wald	Sig.	Exp(B)
Age	-0.005	0.002	7.026	0.008	0.995
Distance	-0.099	0.044	4.987	0.026	0.905
Game type	0.173	0.074	5.487	0.019	1.189
Average bet	-0.002	0.001	10.190	0.001	0.998
Incentive	0.007	0.001	34.666	0.000	1.007
Mail	0.179	0.048	13.686	0.000	1.196
Past response rate	6.015	0.100	3589.036	0.000	409.691
Gender	0.053	0.049	1.132	0.287	1.054
Nationality (Italian)	0.086	0.063	1.906	0.167	1.090
Game strength	0.000	0.000	1.009	0.315	1.000
No. of visits	0.000	0.001	0.099	0.753	1.000
Constant	-3.230	0.124	675.972	0.000	0.040

TABLE 5 Regression Coefficients of the Final Logit Model

Item	B	SN	Wald	Sig.	Exp(B)
Age	-0.004	0.002	5.756	0.016	0.996
Distance	-0.092	0.044	4.373	0.037	0.912
Game type	0.189	0.071	7.130	0.008	1.208
Average bet	-0.003	0.001	16.996	0.000	0.997
Incentive	0.006	0.001	37.115	0.000	1.006
Channel	0.176	0.048	13.426	0.000	1.193
Past response rate	6.022	0.090	4456.921	0.000	412.204
Constant	-3.175	0.119	710.613	0.000	0.042

coming to the service. The final model is thus shown in table 5 or in equation script of type:

$$\text{Logit}(p) = \beta_0 + \beta_1x_1 + \beta_2x_2 + \beta_3x_3 + \dots + \beta_kx_k = X\beta, \tag{4}$$

as:

$$\begin{aligned} \text{Logit}(p) = & -3.175 + 6.022 \times \textit{past response rate} + 0.176 \times \textit{channel} \\ & + 0.006 \times \textit{incentive} - 0.003 \times \textit{average bet} \\ & + 0.189 \times \textit{game type}, \end{aligned}$$

where $\text{Logit}(p) = p/(1 + p)$ and p is the probability of successful communication or used coupon. We could also add distance and age to the final model that combined with these regression coefficients proved to be statistically significant but small (0.092 for distance and 0.004 for age).

The major factor affecting future behaviour is Past response behaviour, followed by game type and Channel used. Based on this research one could simplify the model to only past response rate as other factors do not contribute much to the success of direct marketing campaign.

Testing the Logit Model

The model was tested with Omnibus test for validity and Cox & Snells *R*-square as well as Nagelkerke *R* to determine variance explained. Significance is 0.000, which means that at the negligible risk we may reject the hypothesis, that the zero model is better than the last produced. We accept the hypothesis that the elaborated model is better. With the final model we can explain between 41.4 and 58.9% of the variance.

The model has correctly predicted 84.5% percent of responses. The model is more accurate for predictions of customers who won't use the offer. It correctly predicts 91.9% customers. But it's worse in predicting the announcements of customers who will use the offer, the percentage of correctly predicted is 66.9.

The equation that we got from modelling sample data can be applied to each customer in the database. We can calculate the probability of response, which is a combination of predictive variables: age, consumer distance from the casino, type of game, average bet, free play offer amount, direct marketing channel – mail and prior response to free play offer.

Limitations and Further Research

This research has been done using the available determinants as regressors, which is not the best practice. For a better insight of determinants affecting consumer behaviour, a qualitative research (focus groups, pilot research, more testing on smaller samples) as a priori would suggest a better set of determinants. The study is limited to a single casino and can thus be biased by specific properties of their customer base, meaning generalization is not straightforward. Due to data privacy RFM model couldn't have been analysed (i.e. determining which selection criteria would give the best results) and profitability evaluation has been made impossible.

Our research show how logit could be applied to decision making in direct marketing activities. The model we built for a casino company has a joint prediction probability of 84.5%. In terms of industry research, a deeper analysis of performance between various types of RFM models and logit should be done, before the company switches

to the use of the logit model. The company reports a big segment of lost customers (as per RFM model) which would require a broad understanding of their behaviour and a set of activities to bring them back. None of suggested models address this issue. Situational (those that only become loyal given a certain incentive from the company) and true loyalist should also be addressed separately, as company is losing money on the second group which would come to the service regardless of the direct marketing support received.

It also needs to be stressed that the model was built on a single casino customer base and it is yet to be tested on other casinos to eliminate specific casino properties.

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Modelling of Construction Products and Services for Effective Productisation

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Modelling of construction products and services has major importance for effective productisation of construction companies' offering. Productisation refers to the process of analysing customer needs and defining the offering both commercially and technically so that the efficiency of the productisation can be repeated and the offering is possible to understand. Productised offering is possible to be sold, delivered and invoiced while the effectiveness of construction activities can be maximised. The purpose of this paper is to demonstrate the importance of modelling construction products and services to enable effective productisation of the offering. The study is realised as a combination of a literature review, analysing apartments and houses available by real estate search engines, and analysing constructors' descriptions on method of construction. The study applies the product structure concept. The results include presenting an example of modelling construction offering both as a product and as a service in a manner that enables effective productisation. The findings support productisation to have a role in systematising and tangibilising the construction offering and indicates commercial and technical modelling to support maximising the effectiveness of construction activities. The results support increasing the understanding over modelling construction offering and commercial productisation of the offering. The productisation differences of construction offering modelled as a product and as a service are on the side of technical implementation. Construction companies and managers can benefit of the results while considering modelling their offering and the related productisation logic.

Key words: productisation, commercial product portfolio, technical product portfolio, management, product portfolio management, construction products, construction services

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Introduction

Construction offering has typically been viewed as a product in the form of completed facility that is a result of a production process, but construction is also provided as service products (Maloney 2002). In general products and services are necessary to understand and maintain both on the commercial side including the understanding of sellable items and in terms of the technical structure, and technical interrelations. Hence, a level of modelling is necessary.

The discussion on modelling in the construction context has a specific focus. For example, modelling of buildings are discussed to give architecture, engineering, and construction professionals insights and tools for the more efficient planning, designing, constructing, and for managing buildings. The discussion under the Building Information Modelling (BIM) covers construction and construction process related information in digital format to cover the entire lifecycle (Azhar et al. 2008; Cerovsek 2011). However, in a way BIM could be seen as a new process to provide more than computer aided design (CAD) (Azhar et al. 2008, 4). The construction related modelling has evolved from building description system (Eastman 1976), building product model (Björk 1989), and generic building modelling (Eastman and Siabiris 1995) to the modern BIM. However, BIM does not clearly consider modelling from the perspective of product structure, which without a doubt could be built in. Product structure refers to 'an organised hierarchical collection of technical objects that are linked via "part-of" relationships' (Pinquié et al. 2015). This even if the importance of adapting the information model to the building process and product structure has been highlighted (Olofsson, Stehn, and Cassel-Enqvist 2004). In fact the lack of product structure has been argued as the missing link of the BIM approach (Botton et al. 2016). Product structure would further support product configuration and modularity considerations.

Product configuration is rather scarcely discussed in the construction context involving construction product families and architectures (Hvam, Mortensen, and Riis 2008). Prefabrication is used in construction, but it is seen unable to provide satisfactory results as the activities are rather wasteful (Tam et al. 2007). The industrialisation of housing production have learned from other manufacturing processes and have gained benefits by managing the entire production system from supply-chain management to factory production to sales and on-site activities with adequate balance of standardisation and flexibility (Gann 1996). In fact, the off-site construction is seen to have paramount significance for the efficiency (Taylor 2010).

Nevertheless, product configurability has been considered in the construction context with product family type decomposition that is opened to system and subsystem levels, and modules and components (Jensen, Lidelöw, and Olofsson 2015). Configurability of construction service products has not been discussed. Jensen, Lidelöw, and Olofsson (2015) have also noticed that construction product configuration should be based on a modular architecture. Nevertheless, according to Jensen, Olofsson, and Johnsson (2012) modules more complex than building elements are rare in construction. However, the portfolio perspective and commercial and technical portfolios in this context are yet to be considered.

The modularity has been discussed in the construction context also to a rather moderate extent (Björnfot and Stehn 2007). In construction, product modularity is affected by the degree of component independence and the degree of interface standardisation (Voordijk, Meijboom, and de Haan 2006). If considering process modularity in the construction context, the used production and manufacturing techniques have great significance (Voordijk, Meijboom, and de Haan 2006). Modular construction is, for example, considered for modules for heating, ventilating and air conditioning (Pasquire and Connolly 2002). The modularity is more considered in the off-site building discussion, where some scepticism for complete modular buildings have been presented (Pan, Gibb, and Dainty 2007). Some define offsite in construction context as the manufacture and pre-assembly of components, elements or modules before installation in final location (Goodier and Gibb 2007). There is also discussion under the terms of modern methods of construction that cover off-site manufacturing, prefabrication and off-site production (Nadim and Goulding 2010). However, rather little discussion exists on construction modularity compared to other industrial sectors (Antonio, Yam, and Tang 2007; Pandremenos et al. 2009). The product portfolios have neither been discussed in the construction context to include the commercial and technical considerations. Furthermore, the configurability and modularity have not been clearly discussed together in this context.

Productisation also relates to the management of products and services and the commercial and technical product portfolios (Harkonen, Tolonen, and Haapasalo 2018; Tolonen et al. 2018). The concept of productisation relates to a process of analysing a need, defining and combining suitable elements, into a product-like defined set of deliverables (Harkonen, Haapasalo, and Hanninen 2015). Productisation also plays a role managing the service offering (Harko-

nen, Tolonen, and Haapasalo 2017). Productisation simply addresses the inefficiency involved in production of products and services (Jaakkola 2011; Valminen and Toivonen 2012). The relationship of modelling of products and services and the concept of productisation has been discussed to some extent (Harkonen, Tolonen, and Haapasalo 2018; Tolonen et al. 2018), but the previous discussion has been particularly limited in the construction context.

The above discussion can be condensed into the following research question:

RQ How can construction products and services be modelled for effective productisation?

The above research question is attempted to answer by the means of an extensive literature review and by providing an example of modelling manufacturing products and services.

Literature Review

PRODUCT PORTFOLIO MANAGEMENT

A company's offering can be considered along the lines of product structure concept by considering product families and product variants (Pavlic et al. 2004). Product structure concepts supports decision making and can lead to cost advantage solutions (Ripperda and Krause 2015). The modular product structures can also reduce the variety within a company while offering improved variety to the external customer (Krause et al. 2014). From the customer perspective, a configurable product can be composed according to the needs of a customer based on a generic product structure (Pavlic et al. 2004). Customer satisfaction, an imperative factor for successful business (Vukasovic and Mikulic 2014) can be supported by configurable product and service offering. Also, multiple different views can be considered for the product structure to benefit various stakeholders (Kropsu-Vehkaperä and Haapasalo 2011).

The product structure concept can be utilised in the product portfolio management context by considering the commercial and technical portfolios (figure 1). This type of division has been considered for physical products (Tolonen, Harkonen, and Haapasalo 2014; Tolonen 2016; Kokkonen 2017; Mustonen 2017) and for services (Harkonen, Tolonen, and Haapasalo 2017; Harkonen, Tolonen, and Haapasalo 2018; Mustonen 2017). The commercial perspective has a customer focus and is familiar with marketing, sales, and product management (Tolonen, Harkonen, and Haapasalo 2014). Commercial productisation for sales offers, contracts, orders, deliveries and invoices

takes place on the side of commercial portfolio (Tolonen et al. 2018). The technical perspective is understood more deeply by the product/service development, engineering, testing, purchasing, logistics, and suppliers (Tolonen, Harkonen, and Haapsalo 2014). Technical productisation for product development, supply management, manufacturing, and service processes takes place on the side of technical portfolio (Tolonen et al. 2018).

The commercial product and service portfolios have a hierarchy that can be formed for example to consist of product families, product configurations and sales items (Harkonen, Tolonen, and Haapasalo 2017; 2018; Kokkonen 2017; Tolonen, Harkonen, and Haapasalo 2014; Tolonen et al. 2018; Tolonen 2016). There are no differences in the logic of commercial portfolio of products or services (Harkonen, Tolonen, and Haapasalo 2018; Tolonen et al. 2018). The difference between physical products and service products lies in the technical implementation. When considered as products, the technical product portfolio consists of all hierarchies of platforms, assemblies, sub-assemblies, components and materials that are used for creating the product offering (Harkonen, Tolonen, and Haapasalo 2018; Tolonen, Harkonen, and Haapasalo 2014; 2018; Tolonen 2016). Should the offering be considered as a service, the technical portfolio consist of service processes, sub-service processes, resources, parts and materials that are needed for creating the service offering (Harkonen, Tolonen, and Haapasalo 2017; 2018; Tolonen et al. 2018). Regardless of the differences on the technical side, common to products and services is that should there be any changes to the product within the structure it will have impacts both in a commercial sense, and in a technical sense (Orfi, Terpenney, and Asli 2011). Therefore, when considering productisation in the context of commercial and technical portfolios, the focus of productisation is primarily on the commercial portfolio once the technical side have been modelled and involves considerations surrounding product configurations and sales items (Harkonen, Tolonen, and Haapasalo 2018).

The idea of product portfolio management relates to the need to monitor and react to the behaviour of products and services both in the markets and inside the company to maximise the effectiveness (Cooper, Edgett, and Kleinschmidt 1997). This applies vertically over the product structure, but also horizontally over the life-cycle (Tolonen 2016). The horizontal considerations can for example use the division as illustrated by figure 2. Construction projects being costly and often exceeding the planned scenario (Peleskei et al.

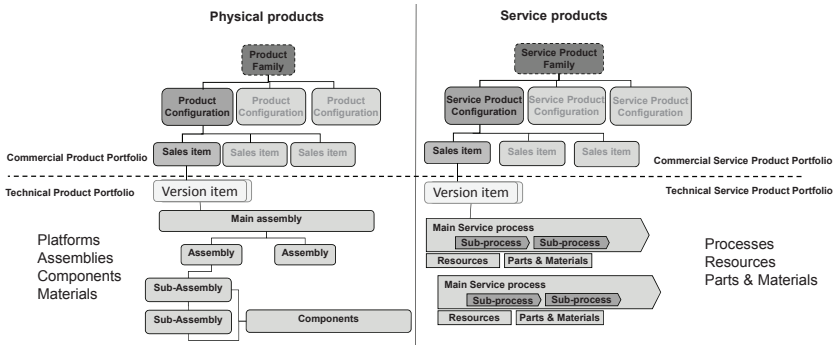
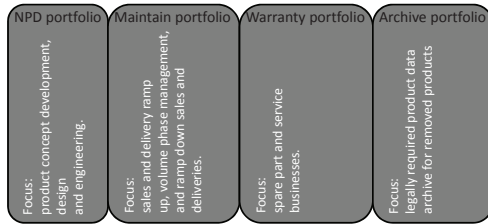


FIGURE 1 Product Structure Concept in the Portfolio Management Context: Physical Products vs. Service Products (adapted from Harkonen, Tolonen, and Haapasalo 2018, 4)

FIGURE 2 Product Portfolio Management Considerations Horizontally over Life-Cycle (adapted from Tolonen et al. 2015a, 472)



2015) can be addressed by the potential for effectiveness maximisation enabled by the effectiveness of productising the construction offering. Also, while introducing of new products on the market is important (Vukasovic and Zidar 2014), the portfolio must be maintained to avoid unnecessary accumulation of products within a certain life-cycle stage.

Research Process

The study is realised as a combination of a literature review, analysing apartments and houses available by real estate search engines, and analysing constructors’ descriptions on method of construction. A hypothetical example of modelling construction offering is created based on real estate search engine results and the analysed descriptions on method of construction. The created example of modelling construction offering is done so that the offering is presented both as a product and as a service. The study applies the product structure concept. The construction offering is modelled to include both, the commercial and the technical product portfolio.

The literature review aims to provide relevant understanding over the importance of modelling products and services, productisation, and product portfolio management. The construction industry specific context is touched upon to a necessary level. The literature review is realised by conducting key word searches and analysing the relevant content. Apartment and house layouts are analysed by utilising real estate search engines of Etuovi.com and Rightmove.co.uk to obtain understanding over what type of elements different size houses and apartments constitute. The obtained understanding is utilised to model example commercial portfolios. The technical portfolios are considered to the extent possible by publically available material. Constructors' descriptions on method of construction are particularly utilised for providing an example how the technical portfolio can be modelled when the offering is provided as a service. The constructors' descriptions on method of construction have been obtained from Finnish construction companies' information on newly built apartment projects. The construction companies whose descriptions of method of construction have been analysed include Rakennusteho, Hartela, YIT, Lehto group, and Lapti. The concept of productisation is demonstrated in the context of modelling product and service portfolios in the construction setting. The apartment and house layouts, and the analysed documentation allowed gaining a general understanding of the construction offering. The proposed modelling have not been reviewed with construction professionals. None of the construction companies whose descriptions of method of construction are analysed have clearly modelled the commercial offering. The extent of different actors having modelled their technical portfolio is not possible to analyse within the boundaries of this study.

Results

The construction companies have typically not clearly modelled the commercial side of their offering. Also, the pricing of the offering and the controllability of the offering are very much company specific. Modelling would help these considerations and support minimising wasteful activities and maximising the effectiveness of construction practices. The offering life-cycle stages would also be possible to address with a modelled offering.

As a major result of this study, an example of commercial portfolio is modelled for construction offering both as a product and as a service. The commercial product portfolio consists of seven product families of Apartments, Detached houses, Semi-detached houses,

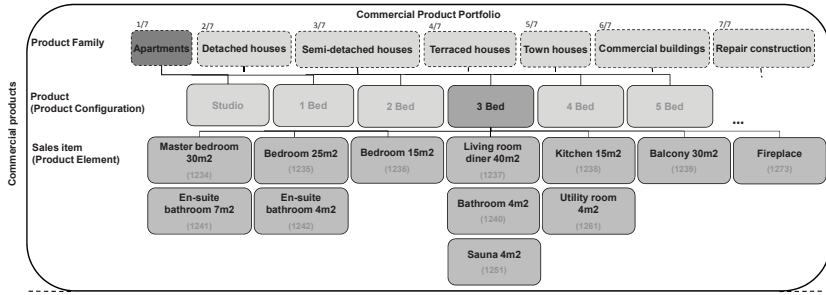


FIGURE 3 Commercial Product Portfolio for Construction Offering Modelled as a Product

Town houses, Commercial buildings, and repair construction (figure 3).

In the example the product family of Apartments is further divided into Product configurations based on the number of bedrooms. The product configuration is the product that the customer buys. In the example the product configuration consisting of three bedrooms is further divided into individual sales items, the product elements. Each of the sales items can be priced individually, and in the case of construction products also sold separately until the point of locking the product configuration. The 148 square meter, three bedroom apartment consists of three different size bedrooms, two of which equipped with en-suite bathrooms. The living room diner is a space consisting of the living room space and the dining area. The living room diner has access to a bathroom and a sauna that are linked. The modelled apartment has a separate kitchen that links to a utility room. The apartment also has a balcony and a fireplace.

Figure 4 illustrates the modelled commercial portfolio for the construction offering as a service and reveals how there are no differences in the modelling on the commercial side. The main difference on the commercial side is whether talking about products or services.

The presented example of the commercial product family of Apartments was modelled based on the analysed apartment layouts and the elements the apartments constitute as presented by the real estate search engines. The product configuration of three bedrooms is hypothetical based on the elements the apartments constitute. The sales items are those elements the example apartment constitutes. Each of the product families can be modelled by using the same logic so that each product family constitutes a number of product configurations. The sales items would constitute of the options possible for

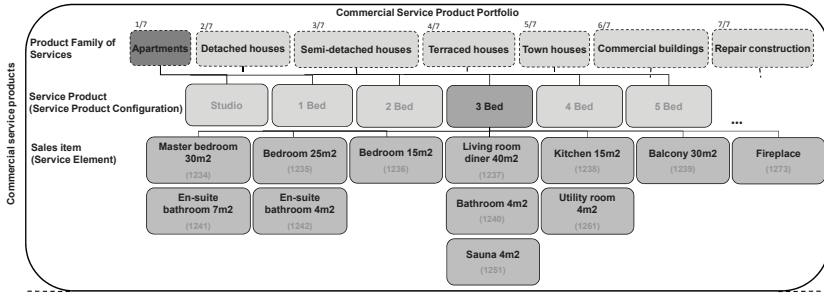


FIGURE 4 Commercial Product Portfolio for Construction Offering Modelled as a Service

customers, those that the company is willing to provide. The service product configurations of the product families of commercial buildings and repair construction would follow a slightly different logic to that of residential buildings. Also the sales items for these product families can be different.

The modelled commercial portfolio allows selling the construction offering so that there is no need to re-consider everything from scratch every time, but the customer and the sales can together select a suitable product family and configure the needed offering based on configure-to-order methods, instead of engineering-to-order. A construction actor can have pre-thought options it is willing to provide, and if customisation is offered the logic to do it in a manageable manner does exist. Modelling of the construction offering also supports pricing considerations as each of the sales items is known. Once the construction offering is modelled, there will be data available to support life-cycle activities involving the offering, for example for maintenance or repair purposes. Also the warranty period is better supported. As a result the same construction offering can be provided a number of times, and new products and services produced in a manageable fashion.

The technical product portfolio of construction offering modelled as a product is based on modules that represent a set of platforms, assemblies, components and materials (figure 5). Each of the modules links to related sales items and product configurations. The modules represent elements possible so that a variety of allowed options are represented. The variety can be set based on company motivations and willingness to provide different modules. Each of the modules presents one way of providing the module, and any differences are represented by version numbers. The coding of the sales items and the corresponding version items support data manage-

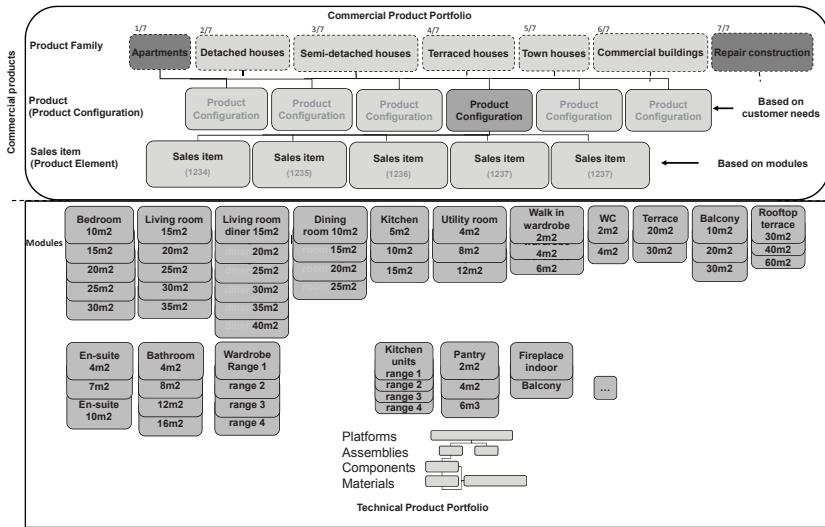


FIGURE 5 Commercial and Technical Product Portfolio of Construction Offering Modelled as a Product: Technical Portfolio Based on Modules

ment and relate to the configurability of the commercial portfolio and the modularity of the technical portfolio.

The technical product portfolio of construction offering modelled as a service is based on platforms that represent the methods of construction (figure 6). Constructors' descriptions on method of construction are utilised for considering the necessary platforms. The platforms link to corresponding service processes and to related sales items and service product configurations. The platforms represent the methods available for construction. Each of the platform represent the use of the method in a certain way and any differences are presented by version numbers. The service processes consist of a combination of the available methods represented by the platforms so that methods with suitable version numbers are linked to corresponding processes. The coding of the sales items and the corresponding version items support data management and relate to the configurability of the commercial portfolio and the modularity of the technical portfolio in the same manner as if modelled as a product. The main difference when modelled as a service is that the technical portfolio consists of processes and instead of pre-defined modules methods of construction are relevant. In both ways of modelling the technical portfolio is modular and the commercial portfolio is configurable. The technical portfolio when modelled as a service can

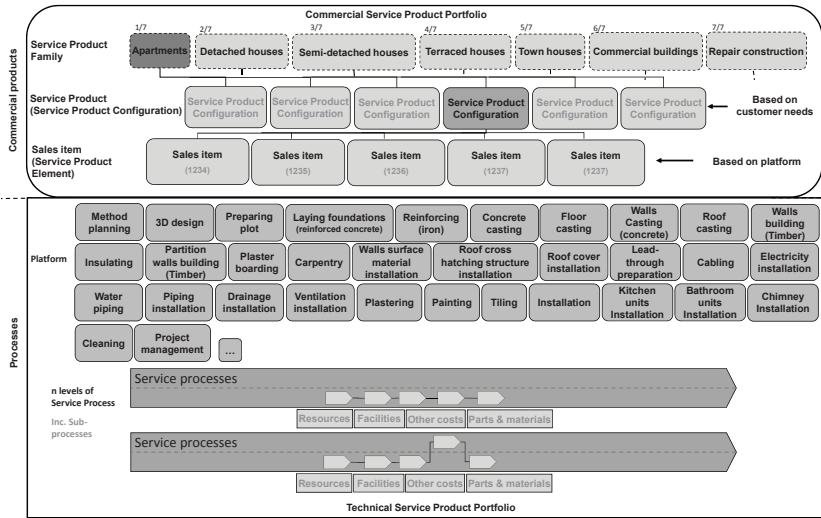


FIGURE 6 Commercial and Technical Product Portfolio of Construction Offering Modelled as a Service: Technical Portfolio Based on Platforms

consist of a number of process levels that consist of related sub-processes, necessary labour, parts item and Sales material, facilities, and such. The number of process levels can for example link to the number of levels of bills of materials to ensure ease of compatibility. The applied modelling can provide clarity so that similar things are always considered the same way.

The construction offering can be modelled both as a product and as a service and presented generically as in figure 7. It is the level of detail that is reduced. Modelling each individual product or service in detail requires using an adequate system that allows also visually viewing the linkages. For both, modelled as a product or as a service, the commercial portfolio can be broken down to product families that can be further broken down to product configurations, and related sales items that are further connected to corresponding technical version items. The commercial sales items for services can either be exactly the same as for products, or can be the methods that constitute the platforms in case of services. If this was the case the sales items could be for example insulating or plastering. Version items would then be then certain type of insulating or plastering. If the service sales item was to be for example 15 square meter kitchen, then the processes would consist of a combination of necessary platforms organised as a set of processes. The service processes can be either internal only without visibility by customers, or with

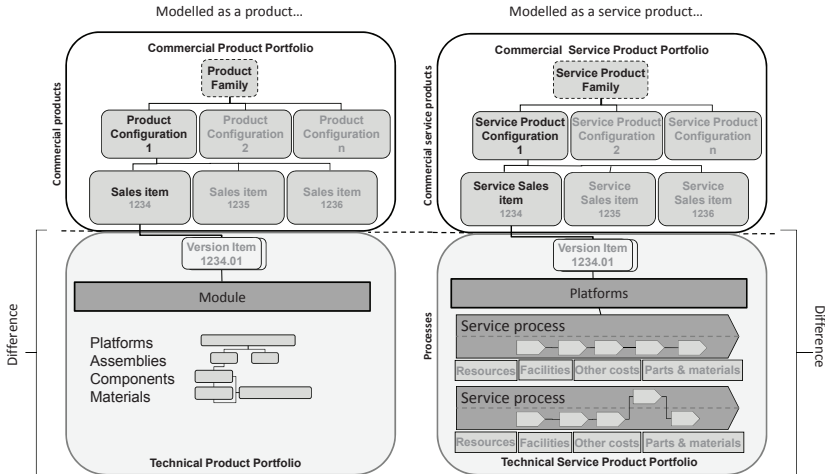


FIGURE 7 The Modelled Construction Offering as Commercial and Technical Product Portfolios Both as a Product and as a Service

customer involvement. All the service processes are linked to necessary resources, facilities, parts and materials.

The modelling of construction services enables to analyse the formation of the product or service prices in a rather detailed level. This may also allow considering different pricing mechanisms.

Finding 1. Modelling of construction products and services according to commercial and technical portfolios provides the necessary platform for analysing the formation of construction products and services to enable maximising the effectiveness of construction activities.

Discussion

Modelling of construction products and services appears to provide the necessary frame for effective commercial and technical productisation of construction offering. Modelling of the offering is necessary to have the needed frame for productisation. Once the construction offering has been modelled, productisation can focus on the commercial side of the product or service portfolio.

The primary focus of productisation is on the product/service configurations should there be needs to provide something new the existing portfolio does not directly contain. The new product/service configurations are mainly created based on the existing sales items that the company knows and understands the costs. This way there

are no need of carry out productisation activities on the technical side of the portfolio. Ideally customer needs can be met by product/service product configurations, or individual sales items. The company's existing product/service product portfolio can be complemented by developing additional product/service variants by creating new sales items. It is, however, important to understand that each new sales item involves new version items due to changes in technical implementation. In case the existing modules (construction offering as a product), and platforms (construction offering as a service) do not provide the necessary possibilities for new products or services, the introduction of new modules or platforms may need to be considered. However, in order to maintain the portfolio balance also horizontally, new products and services cannot be added in an uncontrolled fashion, but some products/services may need to move along the horizontal portfolio stages. In case a company has not modelled its construction offering before, the productisation can involve the modelling activities.

Modelling of construction products/services can provide necessary clarity for effective management of the offering, aside providing frame for effective productisation. Also the repeatability of construction products/services is supported. The manufacturing offering related life-cycle and data considerations may also become more tangible along the modelling when using the product structure concept in the context of commercial and technical product/service product portfolios.

Finding 2. Modelling construction offering by using the product structure concept allows a manageable logic for productising construction offering as products or services.

The results indicate that construction products and services can be modelled to some extent, even without the direct company involvement. Particularly the commercial portfolio can be modelled rather well with the help of public information. The positioning of the construction company in the value chain can impact whether the technical portfolio is to be modelled as a product or as a service. Overall, modelling construction offering can support meeting the purpose of product portfolio management of monitoring and reacting to the behaviour of products/services in the company and in the markets to support maximising the effectiveness of construction activities and enable optimal overall company results. Portfolio management enables focusing on providing products and services that are profitable and in line with the company strategy.

SCIENTIFIC IMPLICATIONS

The scientific implications include highlighting the construction offering as products and services in the light of the product structure concept, supporting the understanding in related literature (Maloney 2002; Piquié et al. 2015). The findings support the linking of product structure and information model, hence supporting previous literature (Olofsson, Stehn, and Cassel-Enqvist 2004). This study provides new to the previous literature by emphasising the support product structure can provide for configurability and modularity considerations in the construction industry. Support is provided particularly for Boton et al. (2016) who highlight how construction related modelling might be lacking the product structure perspective by this study proving a practical example of its utilisation.

New perspectives are provided for product configuration related construction discussion (Gann 1996; Jensen, Olofsson, and Johnson 2012; Jensen, Lidelöw, and Olofsson 2015; Tam et al. 2007; Taylor 2010) by providing an example of how the construction related commercial portfolio can be formed by using the product structure concept. The commercial product/service portfolio is configurable.

New perspectives are also provided for the construction related modularity discussion (Antonio, Yam, and Tang 2007; Björnfort and Stehn 2007; Goodier and Gibb 2007; Nadim and Goulding 2010; Pan, Gibb, and Dainty 2007; Pandremenos et al. 2009; Pasquire and Connolly 2002; Voordijk, Meijboom, and de Haan 2006) by providing a practical example of how the construction related technical portfolio can be formed by using the product structure concept. The technical product/service portfolio is modular.

The role of productisation is further clarified by providing an example in the construction industry context on modelling products/services as commercial and technical portfolios. This study, hence, supports Harkonen, Tolonen, and Haapasalo (2017; 2018), Tolonen, Harkonen, and Haapasalo (2014), Tolonen et al. (2018), and Tolonen (2016). The understanding on product/service product structure and the focus of productisation by (Harkonen, Tolonen, and Haapasalo 2018; Tolonen et al. 2018) is further supported. Jaakkola (2011) is also supported by providing new understanding of the role of productisation in respect to modelling products/services and the focus of productisation. Harkonen, Tolonen, and Haapasalo (2017) is also complemented by providing an example in the construction industry context. Tolonen, Harkonen, and Haapasalo (2014), and Tolonen (2016) are complemented by providing another ex-

ample in the context of portfolio thinking. Cooper, Edgett, and Kleinschmidt (1997) is supported by providing a practical example of a frame in the construction industry context to support product/service portfolio management to enable monitoring and reacting to the behaviour of products and services in the markets and within the company.

MANAGERIAL IMPLICATIONS

The managerial implications of the study include providing an example of how the product structure concept can be applied, and how manufacturing offering can be modelled and productised as a product or as a service as commercial and technical portfolios. The importance of modelling construction offering is emphasised to allow effective productisation. Construction managers' understanding on the significance of commercial and technical portfolios is also supported. The study provides a simple example of how the configurability and the modularity of construction offering can be ensured in a manageable fashion. The life-cycle considerations along the construction portfolio are also supported. Managers can benefit of the provided frame and logic for productising construction products and services. Overall, a simple frame is provided to support maximising the effectiveness of construction activities.

LIMITATIONS AND FUTURE STUDIES

The limitations of this study include modelling of construction products and services along the product structure concept and commercial and technical portfolios by utilising publicly available material, and not confirming the findings with construction professionals or obtaining their feedback. Only one simple example is provided that can, however, be utilised by construction or any other professionals in their fields. Also, more real estate search engines could have been included in the analysis, but it is questionable whether they would have added any further value. Analysed constructors' descriptions on method of construction are also limited to building of reinforced concrete frame apartment buildings, whereas the technical portfolio might look somewhat different should other types of buildings be modelled. Naturally there are possibilities of modelling slightly differently as commercial and technical portfolios, while the main principle remains the same. The future studies can involve addressing the limitations of this study. Also, future studies can involve analysing pricing and costing products and services in the portfolio context, and further analysing the performance management and

key performance indices in the context of commercial and technical portfolios and productisation. Further analysing product structure concept, productisation, and commercial and technical portfolios in the building information modelling context might prove an interesting topic for a future study.

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Smart Factories from Business, Management and Accounting Perspective: A Systemic Analysis of Current Research

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The primary purpose of this study is to investigate to what extent smart factories have been addressed in the research in the business, management and accounting field and to identify possible gaps in the current research. The bibliographic units from the Scopus database on the keyword 'smart factory,' limited to the business, management and accounting research field was searched. In order to answer research questions, a bibliometric analysis and the data mining was performed. From the text of founded articles, gaps in the current research were searched in order to provide guidance for future research directions. There is a growing trend on the smart factory topic, but they are mostly connected with the field of engineering, decision-making, or computer science. Fields most explored are management of supply chains, changes in business models, individualization of production system and business processes optimization. The important gap is the lack of studies in the field of human resources management.

Key words: smart factory, literature review, management, content analysis, systematic analysis

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Introduction

In Germany, a new concept of economic policy called 'Industry 4.0' was developed in 2011, based on high-tech strategies (Mosconi 2014). The concept posits a fourth industrial revolution based on concepts and technologies that include Cyber-Physical Systems (CPS), the Internet of Things (IoT), and the Internet of Services (IoS) (Möller 2016). Industry 4.0 is currently one of the most discussed topics in both the academic and business worlds (Foidl and Felderer 2016). The three key components of Industry 4.0 are cyber-physical

systems (links between the virtual in the virtual world), the IoT, and the IoS (Dominici et al. 2016). Such new concepts force companies to transform their traditional business models into digital business models, which presents a huge challenge for these companies. New business model involves 'the virtualisation and vertical and horizontal integration of the value chain, digital services, the digital transformation of products, production equipment, factories and supply chains' (Cozmiuc and Petrison 2018).

As for Industry 4.0, we cannot limit ourselves to thinking of robotics in automation of production, because it is the digitization of business processes as a whole; it involves adapting processes in the purchase of raw materials and how the product travels through production and is finally delivered to the customer. In this area, we expect the automation of processes, which requires certain automation of work. Value added will arise from new products and new solutions (Kane et al. 2015). Industry 4.0 creates what is called a 'smart factory.'

Smart factories are one of the critical components of Industry 4.0. Gilchrist (2016), Ghobakhloo (2018), Liao et al. (2017), Santos et al. (2017), Ustundag and Cevikcan (2017), Vogel-Heuser and Hess (2016) believe that Industry 4.0 can be defined based on two categories: its principles of design and its technological trends. The principles of design represent the systematisation of knowledge and a description of the components that are an integral part of Industry 4.0 (Hermann, Pentek, and Otto 2016). These enable key stakeholders to monitor the progress of Industry 4.0 and help them to choose the appropriate procedures and solutions needed for the continued transition to Industry 4.0. Technological trends are related to advance digital technology innovations, which together enable the emergence of a new digital industry, i.e., Industry 4.0 (Gilchrist 2016; Liao et al. 2017). Industry 4.0, as an integrative value creation system, consists of 12 principles of design, including virtualisation, decentralisation, modularity, interoperability, smart products, smart factories, etc. and 14 technological trends, including block chain technology, Internet of thing, Internet of services, cyber-physical systems, etc. Smart factories are therefore placed in the principles of design, the component of Industry 4.0 (Ghobakhloo 2018).

A smart factory is the main feature of Industry 4.0 and is characterised 'by self-organised multi-agent systems assisted with Big Data-based feedback and coordination' (Russell and Norvig 2009). A smart factory can develop products virtually; in current times, companies can run virtual experiments on a digital prototype. Within the

modular structured, smart factories, cyber-physical systems monitor physical processes, create virtual copies of the physical world, and make decentralised decisions. Via the IoT, cyber-physical systems communicate and cooperate with each other and with people in real-time both internally and across organisational services offered and used by participants of the value chain (Flynn, Dance, and Schaefer 2017). As such, digital manufacturing and design are influencing careers, practices, and processes in companies (Crnjac, Veža, and Banduka 2017).

In this paper, we discuss the smart factory concept, whose main features are a transformation away from paper-based processes to a digital continuum, the transformation of the way products are designed and manufactured, and transformation from conventional business models to smart, digital models (Russel and Norvig 2009). The goal of this paper is to determine to what extent the smart factories are addressed in business, management and accounting research, to reveal research areas on the topic of smart factories and to identify gaps in the current research in order to provide guidance for future research directions.

The concept of the smart factory is mainly discussed from a technical point of view (Sinsel et al. 2017), while the management, especially soft factors of the organization's management, in our opinion, is not addressed enough in research literature. For this reason, the goal of the paper is an analysis of literature dealing with smart factories from business, management, and accounting aspect.

The paper is structured as follows: it starts with the definitions of the concept of a smart factory, as have been given by different authors. The third section present systemic analysis. Finally, the primary research results have been presented and discussed, conclusions and gaps are identified.

The following research questions were set for the purpose of the study:

- RQ1 *To what extent the smart factories have been addressed in the research in the business, management and accounting field and with which fields they are mostly connected?*
- RQ2 *Which are the research gaps?*

Research Methodology

The largest bibliographic database, Scopus database, was included in the study. The bibliographic units on keyword smart factory or factory of future limited by business research area ((ALL ('smart fac-

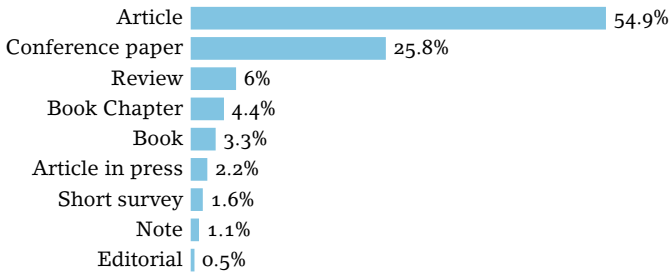


FIGURE 1 Documents by Type

tory’) AND (LIMIT-TO (SUBAREA, ‘BUSI’)) were covered. No other inclusion or exclusion criteria were used. This approach retrieved 182 papers (conference papers, journal papers, book chapters) of all year timespan.

In the first step, bibliometric analysis was performed with the help of Scopus analysis services. Publication years, types of publications, publication sources, research areas, most frequent authors, authors’ affiliations and authors’ country were presented. For performing word phrase analysis, software Provalis Wordstat 8.0 was used. To shed light on smart factory research trends, a statistic review was conducted to identify possible gaps in the current research in order to provide guidance for future research directions.

Results and Discussion

A total number of 182 contributions were found from the Scopus database. The first two contributions on smart factories in business, management and accounting area were detected in the year of 1990 and 1996. In 1990, 1996, 2003, 2004, 2006, 2009, 2010 and 2011 there was one contribution on this topic each year. In 2007 three contributions were detected. Since the Industry 4.0 concept, with the aim to establish smart factories, was first announced at the Hannover Messe 2011 in Germany, a slight increase in the number of contributions in this research area, from the year 2011 to 2014, is noticed. The number of contributions has been increasing dramatically since 2015.

From analysed contributions 104 (57.1%) were published as journal articles, 47 (25.8%) as conference papers in conference proceedings, 11 (6%) as reviews, 8 (4.4%) as book chapters, 6 (3.3%) as books, 3 (1.6%) as short surveys, 2 as notes, and 1 as editorial (Figure 1).

Top eight institutions publishing on the topic of smart factory in the business field are Rheinisch-Westfälische Technische Hochschu-

TABLE 1 Number of Documents by Research Areas

Reserch area	<i>f</i>	%
Business, management and accounting	182	100,0
Engineering	120	65,9
Decision science	87	47,8
Computer science	47	25,8
Mathematics	22	12,1
Energy	16	8,8
Economic, econometrics and finances	15	8,2
Environmental science	10	5,5
Material science	10	5,5
Social science	6	3,3
Others	13	7,1

TABLE 2 The Most Often Used Phrases in Papers

Smart factory	Production processes
Supply chain	Manufacturing system
Cyber physical	Industrial revolution
Internet of Things	Case study
Production systems	Manufacturing companies

le, Politecnico di Milano, Hochschule für Wirtschaft und Recht Berlin, Seoul National University, Friedrich-Alexander-Universität Erlangen-Nürnberg, Technische Universität Braunschweig, Helmut Schmidt University, and University of Cambridge with three or more publications.

Bibliometric analysis on smart factories in order to examine research areas of the contributions was performed. Most of the selected contributions were grouped into categories of engineering, decision science, and computer science, in addition to business, management and accounting.

The largest number of authors is from Germany, which is to be expected, since the concept started in Germany, followed by Italy and United States (Figure 2). The most frequent authors, publishing in the field of smart factory are Ivanov with five contributions, Kletti, Rauch, Sanders, Teresko and Wulfsberg, all with three contributions.

Provalis Wordstat 8.0 program was used to perform a word phrase analysis, which was used in order to enable better understanding of contributions titles. Table 2 shows the most often used phrases in paper titles, followed by phrases 'smart factory,' 'supply chain,' 'cyber physical,' 'Internet of things,' and 'production systems.' Table 3

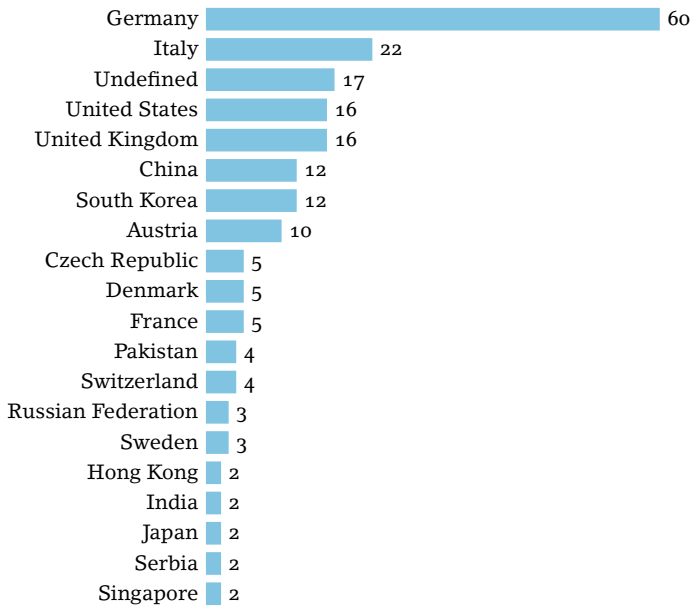


FIGURE 2 Most Frequent Authors' Country

TABLE 3 The Most Commonly Used Words in the Titles

Word	<i>f</i>	Word	<i>f</i>
4.0	14	Management	10
Assessment	5	Manufacturing	13
Energy	5	Production	6
Factory	7	Smart	11
Industry	13	Systems	5

presents most commonly used words in titles of contributions, which were extracted using word list analysis by Atlas.ti program.

In order to answer the second research question, we used cluster analysis of the phrases using Provalis Wordstat version 8.0. Cluster analysis of phrases was conducted using of average-linkage hierarchical clustering algorithm, which creates clusters from a similarity matrix (Everitt et al. 2011).

Figure 3 presents the results of the cluster analysis that identified ten groups of topics regard smart factories, i.e.:

- cluster 1 includes abstracts, with the words analysis and framework,
- cluster 2 includes abstracts with the words factory, smart, and time,

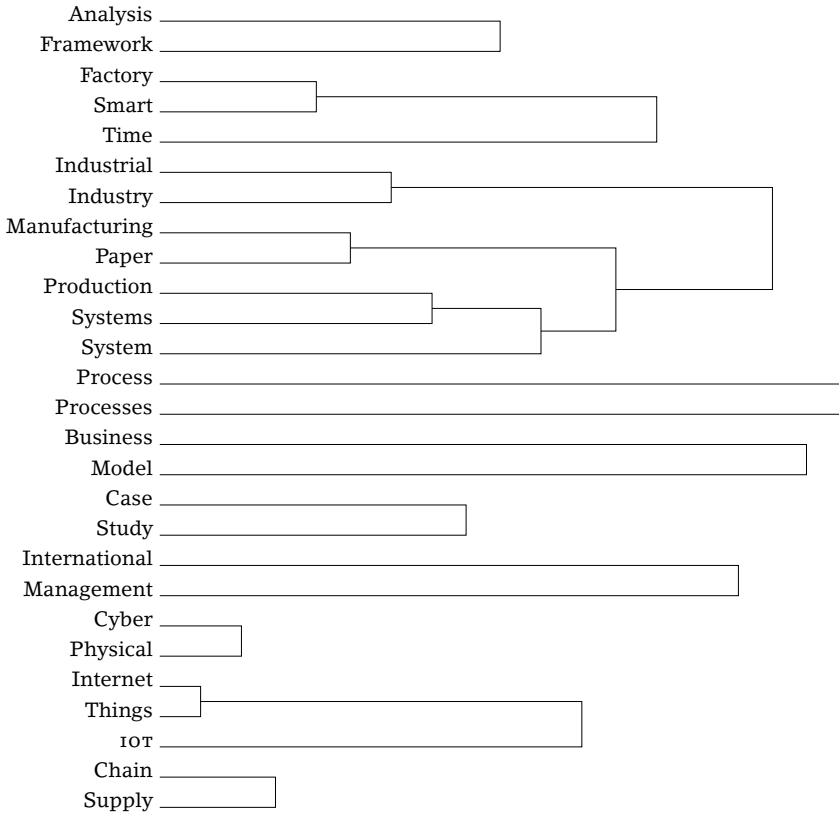


FIGURE 3 Cluster Analysis of Phrases Related to Smart Factories

- cluster 3 includes abstracts with the words industrial, industry, manufacturing, paper, production, systems, and system,
- cluster 4 includes abstracts with the words process and processes,
- cluster 5 includes abstracts with the phrases business and model,
- cluster 6 includes abstracts with the words case and study,
- cluster 7 includes abstracts with the words international and management,
- cluster 8 includes abstracts with the words cyber and physical,
- cluster 9 includes abstracts with the words internet things, and IoT, and
- cluster 10 includes abstracts with the words chain and supply.

We used proximity plots in order to detect phrases that tend to frequently appear near phrase smart factory or smart factories in

the abstracts. The phrases that occur the most often with the phrase smart factory, such as cyber physical and system, time and Internet of Things (IoT), are mostly related to the definition of the smart factory. The phrases that also occur often with the phrase smart factory are related to methods and techniques for data gathering such as case study, analysis framework.

The phrases that occur the most often with the phrase smart factory, and answer the research question 2, indicate its's specific research areas such as supply chain, business model, processes, industrial production (manufacturing) system. Four main lines of research related to business, management and accounting therefore appear in the literature of smart factories: (1) supply chain management, (2) redesign of business models and value creation through new business model, (3) production system (product equipment, product design), and (4) redesign of business processes (process optimization and digitalization).

After we read full texts of all 182 contributions, we could assume that most of them deals with the topic of supply chain management, for instance with interconnections of cross-company supply chains (Bauer, Herkommer, and Schlund 2015), opportunities for circular supply chains (Tsoulakis, Kumar, and Srai 2016), supply chain dynamics (Ivanov, Mason, and Hartl 2016), sustainable supply chains (Bechtsis et al. 2017), followed by value creation through new business model (Schneider, Mittag, and Gausemeier 2016), product individualization (Emmelmann, Rudolph, and Herzog 2017), and business process optimization (Yin, Stecke, and Li 2017).

Production paradigms are and have always been shaped by different factors, i.e. sociological, economic and technological (Chu et al. 2016). Sinsel et al. (2017) and Magone (2016) found that the main perspective in Industry 4.0 is a technological perspective. A few studies on the economic valuation of smart factories exist, such as cost-effectiveness analysis (Sinsel et al. 2017) and studies on the productivity of smart factories (Madsen and Mikkelsen 2018; Munyai, Mboniyane and Mbohwa 2017). The aim of smart factories is not only to create an economic effect, such as reducing costs and increasing productivity, but also to consider human and the sociological aspect of the new paradigm brought by the fourth industrial revolution (Kang et al. 2016).

Conclusion

In this paper, we discuss the concept of smart factory, which main features are transformation away from paper-based processes to

digital continuum, transformation of the way the product are designed and manufactured, and transformation from classic business model to smart, digital model. The main aim of the study is to investigate to what extent the smart factories have been addressed in the research in the business, management and accounting field. To achieve this aim, we performed systematic analysis of the bibliographic units from Scopus database on keyword smart factory or factories of the future and analysed 182 contributions on the topic smart factory. The analysis provided insights into the area of business, management and accounting.

The increasing trend in research from this field is present from 2011. In our research, it was found that research on smart factory in business, management and accounting field are interdisciplinary and are mostly connected with the fields of engineering, decision and computer science. Most of the contributions deals with the topic of supply chain management, business model, production system and business processes.

The paper contributes to a better understanding of research on the smart factory subject, which is not only valuable for academia, but also for factories facing changes of the business model and business processes. Finding of the systemic analysis can be used as the basis for future research in this field. While we believe our study has an important contribution, it has some limitations, for example that we only looked at articles from the database of the Scopus and that the searching was limited to peer-reviewed literature written in English. Future studies on smart factories should therefore also include other databases and literature in other languages.

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Abstracts in Slovene

Družbena odgovornost podjetij v državah v razvoju: študija primera v Vietnamu

Phan Van Thanh in Szilárd Podrúzsik

Članek podaja pregled prakse družbene odgovornosti v vietnamskih podjetjih, zlasti v malih in srednje velikih podjetjih. To je prva raziskava konceptualnega okvirja družbene odgovornosti podjetij in družbene odgovornosti podjetij v državah v razvoju. Poleg povečanja konkurenčnosti vietnamskih podjetij na splošno, zlasti vietnamskih malih in srednje velikih podjetij, se raziskava osredotoča na izkušnje, pridobljene iz empiričnih študij družbene odgovornosti podjetij v državah v razvoju. Poleg tega članek na podlagi analize podjetij in praks družbene odgovornosti združuje priporočila raziskovalcev za povečanje in izboljšanje izvajanja tovrstne prakse v Vietnamu, pa tudi nekaj predlogov kot pomoč vietnamskim podjetjem pri uspešni uporabi prakse družbene odgovornosti za doseganje trajnostnih poslovnih ciljev. V zaključku je navedeno, da je izvajanje te prakse v Vietnamu še vedno omejeno in da obstajajo številne ovire in omejitve pri njeni uporabi - ne samo v podjetjih samih, temveč tudi v operativnem okolju. Zato bi bilo potrebno za uvedbo in integracijo prakse družbene odgovornosti v poslovne strategije vietnamskih podjetij izboljšati ozaveščenost, prav tako pa tudi pravni okvir za njeno izvajanje.

Ključne besede: družbena odgovornost podjetij, države v razvoju, Vietnam, vietnamska mala in srednje velika podjetja

Management 13 (4): 287–300

Družinsko podjetniško nasledstvo: ali izkušnje, pridobljene v družinskem podjetju, res štejejo?

Predrag Ljubotina in Jaka Vadnjal

Potencialni nasledniki družinskih podjetij morajo pri izbiri svoje poklicne poti rešiti kompleksno trilemo. Namesto izbire med podjetništvom in zaposlovanjem morajo kot dodatno možnost upoštevati dedovanje družinskega podjetja. Raziskava GUESS iz leta 2014, ki je bila izvedena med več kot 109.000 študenti v 34 državah, je ponudila možnost, da raziščemo korelacijo med nameni karijerne izbire naslednikov in njihovimi osebnimi motivi, izkušnjami družinskih podjetij in podjetniškimi veščinami posameznikov. Podatke smo analizirali z multinomnalno logistično regresijo, saj se poklicna odločitev meri kot kategorična odvisna spremenljivka s tremi možnimi rešitvami. Našli smo pomembno povezavo med osebnimi motivi in poklicno odločitvijo. Tudi starost, pri kateri se je potencialni naslednik pričel ukvarjati z družinsko dejavnostjo, pomembno vpliva na njegovo ali njeno poklicno izbiro. Po drugi strani smo ugotovili, da dolžina delovanja ni pomemben

dejavnik. V primerjavi z možnostjo zaposlovanja je višja stopnja samo-ocenjenih podjetniških veščin delovala v korist nasledstva.

Ključne besede: družinsko podjetje, nasledstvo, poklicna odločitev, spretnosti, podjetniška vzgoja, čustva

Management 13 (4): 301–322

Izboljšanje učinkovitosti neposrednih marketinških aktivnosti z uporabo analitičnih modelov: RFM proti Logit modelu na primeru igralnice

Tjaša Tabaj Pušnar in Danijel Bratina

Ta raziskava se ukvarja z razvojem in izvajanjem obsežnega analitičnega okvirja za izboljšanje segmentacije in ciljne usmerjenosti dejavnosti neposrednega trženja storitvene dejavnosti. Cilj okvirja je ustvariti model odziva na neposredno trženje, ki uporablja demografske podatke strank in druge vedenjske podatke (kot je odziv na pretekle dejavnosti na področju neposrednega trženja) pridobljene v igralnicah (industrija iger na srečo). Pred to raziskavo je podjetje uporabljalo Recency-Frequency-Monetary model (model RFM). Statistični model, ki se uporablja v naši raziskavi in temelji na logitni regresiji, bistveno izboljša natančnost dejavnosti neposrednega trženja in omogoča vpogled v pomembne značilnosti strank, ki vplivajo na izbiro. Verjamemo, da rezultati predstavljajo kombinacijo velikih, razčlenjenih podatkovnih nizov na posameznih ravneh s tržno analitičnimi rešitvami za izboljšanje odziva na kombinacijo tržnih komunikacij. Kolikor nam je znano v času pisanja tega prispevka, takšna popolna zbirka demografskih in vedenjskih dejavnikov doslej še ni bila uporabljena v analizi učinkovitosti neposrednega trženja na področju igralništva. Ugotovitve v tem dokumentu lahko podjetje uporabi za bistveno izboljšanje optimizacije ciljnih segmentov v svojih dejavnostih neposrednega trženja, koristijo pa lahko tudi drugim industrijam (ki trenutno uporabljajo RFM pri izbiri ciljnih skupin za neposredno trženje).

Ključne besede: učinkovitost neposrednega trženja, RFM, logitno modeliranje

Management 13 (4): 323–334

Modeliranje gradbenih proizvodov in storitev za učinkovito »produktizacijo«

Janne Harkonen, Arto Tolonen in Harri Haapasalo

Modeliranje gradbenih proizvodov in storitev ima velik pomen za učinkovito »produktizacijo« ponudbe gradbenih podjetij. Izraz se nanaša na proces analiziranja potreb kupcev in opredelitev ponudbe v komercialne in tehnične namene, tako da je učinkovitost izdelkov trajna in ponudba razumljiva. Tako oblikovano ponudbo je mogoče prodati, dobaviti in fakturirati, hkrati s tem pa tudi povečati učinkovitost gradbenih dejavnosti. Namen prispevka je prikazati pomen modeliranja

gradbenih proizvodov in storitev z namenom omogočanja učinkovite »produktizacije« ponudbe. Študija je izvedena kot kombinacija pregleda literature, analize stanovanj in hiš, ki so na voljo v iskalnikih nepremičnin, ter analize opisov načinov gradnje, kot so jih podali gradbeniki. Uporablja koncept strukture izdelka. Rezultati vključujejo predstavitev primera modeliranja gradnje, ki ponuja tako proizvod kot storitev na način, ki omogoča učinkovito »produktizacijo«. Ugotovljeno je, da ima ta vloga pri sistematizaciji in večji oprijemljivosti ponudbe v gradbeništvu in nakazuje komercialno in tehnično modeliranje kot podporo povečanju učinkovitosti gradbenih dejavnosti. Rezultati govorijo v prid večjemu razumevanju oblikovanja ponudbe v stroki in komercialne »produktizacije«. Razlike v gradbeni ponudbi, oblikovani kot izdelek in kot storitev, so v tehnični izvedbi. Gradbena podjetja in upravljalci lahko izkoristijo rezultate in razmislijo o morebitnem preoblikovanju svoje ponudbe in s tem povezano produkcijsko logiko.

Ključne besede: »produktizacija«, portfelj komercialnih izdelkov, portfelj tehničnih izdelkov, upravljanje, upravljanje portfeljev izdelkov, gradbeni proizvodi, gradbene storitve

Management 13 (4): 335–353

Pametne tovarne z vidika poslovanja, vodenja in računovodstva: sistemska analiza trenutnih raziskav

Andrej Jerman in Gandolfo Dominici

Glavni namen te študije je raziskati, v kolikšni meri so pametne tovarne obravnavane v raziskavah s področja poslovanja, upravljanja in računovodstva ter ugotoviti morebitne vrzeli v trenutnih raziskavah. Iskali smo bibliografske enote, omejene na poslovno, upravljalško in računovodsko raziskovalno področje s ključno besedo »pametna tovarna« v bazi podatkov Scopus. Da bi odgovorili na raziskovalna vprašanja, smo izvedli bibliometrično analizo in podatkovno rudarjenje. S pomočjo besedil najdenih člankov smo iskali vrzeli v trenutnih raziskavah, da bi začrtali smernice prihodnjim raziskovalnim usmeritvam. Pametne tovarne so rastoč trend, ki pa je večinoma povezan s področjem inženiringa, odločanja ali računalništva. Področja, ki so najbolj raziskana, so upravljanje dobavnih verig, spremembe poslovnih modelov, individualizacija proizvodnega sistema in optimizacija poslovnih procesov. Primanjkuje predvsem študij s področja upravljanja človeških virov.

Ključne besede: pametna tovarna, pregled literature, upravljanje, analiza vsebine, sistematična analiza

Management 13 (4): 355–365