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Drivers and barriers to innovation in the Australian public service: a qualitative thematic analysis

Warit Wipulanusat, Kriengsak Panuwatwanich, Rodney A. Stewart, Jirapon Sunkpho

ABSTRACT

The purpose of this paper was to identify common themes from archival records related to innovation in the Australian Public Service (APS). A thematic analysis was conducted to review and evaluate archival records which consisted of transcripts from senior manager presentations at Innovation Month seminars from 2014 to 2018 and other related official documents. This empirical study addressed innovation from the leaders' perspective, reflecting upon their experience. Analysing themes within archival records helped to gain insights from various perspectives of leaders on how they regard an innovation agenda for the APS. Three themes emerged from archival records: (1) innovation characteristics; (2) drivers of innovation; and (3) barriers to innovation. Synthesis of these drivers and barriers can provide important insights for senior APS managers on how they can enhance their organisations' ability to innovate in order to respond to digital disruption challenges and opportunities. Variety of perspectives with leader's perceptions informs about authors' selection of the research question among consistent patterns and legitimates the salient themes as input for QSR NVivo 11.

KEY WORDS

thematic analysis, public sector innovation, drivers of innovation, barriers to innovation, Australia

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Introduction

One of the most important steps in managing public sector innovation is having an appropriate definition for it. However, the innovation definition has been the subject of debates in the literature. Mulgan and Albury (2003) defined innovation in the public sector as the 'creation and implementation of new processes, products, services, and methods of delivery, which result in significant improvements in outcomes efficiency, effectiveness or quality' (p. 3). Currie et al. (2008) described innovativeness in a public sector context as the search for creative or novel resolutions to problems and demands, including new services, new organisational structures and improved process. Bekkers et al. (2011) explained innovation as a learning process in which governments

attempt to meet specific societal challenges which can be solved by developing new services, technologies, organisational structures, management approaches, governance processes and policy concepts. This conceptualisation emphasises that public sector innovation can be comprehended as an engagement to create new and meaningful connections between government and society.

Moore and Hartley (2008) contend that there are four interdependent attributes differentiating the characteristics of public sector innovations from the private sector. Public sector innovations go beyond organisational frontiers to generate network-based and financial decision-making and production systems; tap new pools of resources; exploit the government's capacity to shape private rights and responsibilities; and redistribute the right to define and judge value. These aspects should be approached in terms of the degree to which they promote justice and the development of a society as well as their efficiency and effectiveness in achieving collectively established goals. Altshuler and Behn (2010) asserted that most public sector innovations were based upon discovery rather than invention. These innovations are typically novel ideas learnt or borrowed from other organisations which are adopted as a solution to some long-lasting problems within the organisation (Wipulanusat et al., 2017a).

Borins (2006) indicated three eminent types of innovation in the public sector: politically led responses to crises, organisational turnarounds engineered by newly appointed agency heads, and bottom-up innovations initiated by frontline public servants and middle managers. The first of these, crisis response, is relatively rare and unique to public sector innovation. Organisational turnaround-driven innovation is commonly seen when there is a performance gap. The third type of innovation is the most desirable, which is driven not by rule-breakers but rather by people showing leadership in delivering value for their stakeholders. Public sector innovation ranges from the incremental deployment of enterprise resource planning software in back-office operations, to the more radical implementation of Web 2.0 technologies to transform citizen engagement via the Internet (Varney, 2006; Wipulanusat et al., 2017b). However, while there are several success stories, the introduction of innovation in the public sector has often failed (Franza & Grant, 2006). This is not essentially due to the specific innovation but rather because the public sector presents significant barriers to workplace innovation: resistance to change, silo thinking, red tape, risk aversion, and hierarchical structure (Borins, 2006; Wipulanusat et al., 2017c).

Over the past decade, interest in public sector innovation has rapidly increased due to various causes. Public trust in government organisations has been decreasing as has public sector credibility. In order to boost public confidence in the public sector, innovation should be adopted as one of the means to fulfil this objective (Altshuler & Behn, 2010; Glor, 1998). In the new era of post-globalisation, innovation is a necessary tool for national economic prosperity. Global competition consequences and information technology require governments to transform their operations and address time-consuming processes (Miller, 1999). Thus, these drivers have been the primary forces that have prompted the public sector to focus on innovation as a means of improving productivity and performance.

Competitive advantage, increased market share, and improved profits are the main drivers that prompt the private sector to value innovation. Even though the drivers are considerably different, innovation in the public sector is of high policy interest because of the potential to improve the efficiency and quality of government services (Moore & Hartley, 2008; Wipulanusat et al., 2018). Berry and Berry (2007) postulate that governments imitate each other in regard to four factors: competition; learning; mandates; and public pressures. All of these variables have a positive effect on the adoption of innovation. Bekkers et al. (2011) contend that innovation represents two different challenges to the public sector. First, the public sector, and subsequently public administration, is regarded as the cornerstone for an innovation-driven economy. With the purpose of making society and the economy more innovative, a public sector needs to prepare and adapt for a novel form of knowledge-based economy. Second, the public sector is required to become innovative in order to confront the challenges facing its future society. Societal threats such as climate change, crime and international economic competition force the public sector to rethink its choice of priorities, solutions and instruments. Moreover, the problems of global crises, ageing societies, environmental challenges and permanently unsustainable public finances in most developed countries reveal that failure to innovate in the public sector creates not just imbalances in societies and budget constraints, but also primary challenges to the sustainable development of these countries.

According to the State of the Service Agency Survey, it was shown that innovation was a key consideration amongst federal departments in the Australian Public Service (APS). The State of the Service Report 2016-17 revealed that 98 percent of federal departments applied an approach for encouraging and promoting innovation (Australian Public Service Commission, 2017) which increased from 82 percent of these federal departments in 2016 (Australian Public Service Commission, 2016). Senior leadership roles supporting new ideas and taking on innovation champions were often cited by subordinates as an effective method to promote and foster innovation in the APS. However, there were some differences among agencies, as to the extent to which innovation was fostered, ranging from fewer than 40 percent to up to 100 percent of employees that they were recognised by their leaders for proposing new ideas (Australian Public Service Commission, 2014). More than half of the employees (53 percent) perceived that there were barriers to achieving an innovative culture in the workplace (Australian Public Service Commission, 2011). The top four barriers identified are budget constraints, unwillingness of manager to take risks, disapproval of ideas by managers, and resistance to change.

This paper aims to report on the findings of the thematic analysis providing empirical knowledge from the APS executives' perspective. Thematic analysis is a technique used to interpret archival records. This method is used as a textual data codification and synthesis technique to reveal deeper meanings of the texts and the latent content to enrich the interpretations (Neuman, 2005). This study conducted a thematic analysis to systematically code and analyse qualitative archival data. Thematic analysis was employed to understand the implicit and explicit meanings of the content and text related to drivers and barriers to innovation in the APS using archival records.

The rest of the paper is organised as follows. Section 1 presents the research method employed using thematic analysis. This is followed by results in Section 2, which reports on the key themes related to innovation in the APS. Finally, Section 3 provides some concluding remarks, highlighting the implications for both theory and practice, and the main contributions of this paper.

1. Methodology

The nature of the social science research has two contrasting views, known as positivism and social constructionism. The key concept of positivism is that the social world exists externally, and thus its properties should be measured through objective methods to formulate and confirm hypotheses to predict general patterns of human activity (Easterby-Smith et al., 2012; Neuman, 2005). In contrast, social constructionism derives from the view that reality is socially constructed and given meaning by people who have different experiences and perceptions (Easterby-Smith et al., 2012).

By considering the underpinning paradigmatic differentiations between the aforementioned philosophical assumptions, another two broadly differing approaches to explain the collection and analysis of data are classified as quantitative and qualitative approaches (Neuman, 2005). Quantitative studies investigate measurable factors and relationships to advance knowledge, through questioning the relationships of variables (Creswell, 2013; Latham, 2014). The quantitative approach focuses on experiments, surveys, or other means of collecting statistical data. In contrast, qualitative research analyses subjective accounts to capture textual data from a few selected cases. Qualitative research methods explain the characteristics of a phenomenon and how the phenomenon works (Latham, 2014). Hence, this method has been associated with social constructionism. The qualitative approach can provide more detail and rich data for the understanding of the phenomenon. This characterises the present study as explanatory research that aims to identify the actual rationale and seek more description of a particular observed phenomenon. The results were used to explain the real-life organisational phenomenon from those who have experience of the situation. A qualitative approach can be conducted with an array of methods including documents, archival records, interviews, and observations (Yin, 2013). In this study, the archival analysis was utilised.

1.1. Archival analysis

Archival records are appropriate to explain the incidence or prevalence of a phenomenon, to obtain a holistic picture of an on-going phenomenon, and can be used to address research issues over time.

Archival research provides multiple levels of evidence: individual, community, organisational, and societal. Moreover, the archival analysis gives detailed, objective, and subjective explanations of phenomena from multiple perspectives to respond to research questions (Hadfield, 2010). This approach is an observational method that is considered unobtrusive because the researcher studies social behaviour without affecting it. Thus, researcher bias is minimised, except in relation to the selection and interpretation of archival records.

Additionally, comprehension and validity are enhanced as a result of both the historically contextual situatedness of accounts and through comparisons between recorded observations and interpretations (May, 2001). The advantage of archival analysis is that it provides an in-depth, replicable methodology to access individual or organisational structures such as cultures, messages, values, intention, cognitions and attitudes. Additionally, it enables researchers to gain insights into managerial cognitions, which surveys or interviews cannot provide at the same level of detail (Pollach, 2012).

Based on the nature of an event, archival analysis can be conducted to examine both past and contemporary events. An archival analysis involves sorting and analysing appropriate publicly available historical data. The use of archival records is important to let evidences speak for themselves. Napier (1989) identified two main phases for analysing data from historical repositories: discovery and contextualising. In discovery, archival researchers discover data sources from archives and perform essentially descriptive work. Subsequently, theorists move to interpret these data sources and add context that allows a broader interpretation of past events.

The archival analysis was utilised to obtain a better understanding and explain the current phenomena of innovation in the APS. It was conducted to establish timely and sequential historical records that addressed the research questions of this study. Archival records can be obtained from various sources such as letters, memoranda, agenda, announcements, speeches, presentation, minutes of the meetings, administrative documents, organisational reports, newspapers, and other articles appearing in the mass media (Bowen, 2009; Yin, 2013). Thematic analysis is a systematic method which was conducted herein to review and evaluate the themes that emerged from archival records.

1.2. Thematic analysis

Thematic analysis is an independent qualitative approach which examines research data by identifying, analysing and reporting themes within data (Braun & Clarke, 2006). This method involves the identification of themes that appear significant for explaining the qualitative richness of the phenomenon (Fereday & Muir-Cochrane, 2006). A theme is defined as a coherent integration of repeated patterns of meaning in the information, which determines the possible observations, construes facets of the phenomena, and identifies the findings (Vaismoradi et al., 2013). An inductive approach was used to derive the explicit meaning of the full range of the themes, and then directly identifying new themes from the text data (Braun & Clarke, 2006). The approach was used to code the text without using an initial a priori coding template, which is appropriate for this study because no previous study had described the phenomenon (Hsieh & Shannon, 2005). This study applied the QSR NVivo 11 to aid thematic analysis for data coding and theme identification.

The primary qualitative data were collected from recorded talks given by leaders who were invited to speak about innovation in the APS during Innovation Month, in the years 2014 to 2018. The profiles of the speakers are shown in Tab. 1. Innovation Month is organised by the Commonwealth Government and governmental departments as an annual event, consisting of seminars on innovation, a series of innovative activities relating to innovation, and the distribution of awards for innovative employees and departments.

This study considered video transcripts of speakers to be beneficial in reflecting the viewpoints of informants. Therefore, these video transcripts were categorised as proxy primary sources of data because they reflected the eyewitnesses' accounts of actual practices in the public sectors. They were free from researcher bias and interpretation and were used to address the objectives and goals of this research. Additionally, valuable insights were obtained from analysing the publicly available data (Saunders et al., 2003). The evidence provided the themes of interest and explained the relationships between these themes. This study used a non-probability purposive sampling, where speakers were chosen based on the research criteria. A sample of 12 was considered sufficient to provide an accurate explanation of phenomena and establish a stable view of parameters (Guest et al., 2006). Therefore, 16 recorded talks were

Tab. 1. Details of presentations from Innovation Month seminars

Year	Position	Topic
2014	Secretary, Department of Industry	Innovation Month 2014 launch
	Deputy Secretary, Department of Human Services	Leadership or Leadersunk: are new models of leadership needed when it comes to innovation in the Australian Public Service? (Part 1)
	Director General, IP Australia	Leadership or Leadersunk: are new models of leadership needed when it comes to innovation in the Australian Public Service? (Part 2)
	Chief Technology Officer, Department of Finance	Feel the Wind: Set yourself the bolder course.
	Director of Coordination and Gov 2.0	Innovation Month Pattern Breaking Summit
2015	Secretary, Department of Industry and Science	Innovation Month 2015 Launch
	Secretary, Department of Health	Innovation within the Department of Health
	Secretary, Department of Infrastructure and Regional Development	Are we there yet?
	Director, Digital Transformation Office	The Computer Says Yes
2016	Deputy Secretary, Department of Industry, Innovation, and Science	Innovation Month 2016 Launch
	Secretary, Department of Health	Future Frontiers (Part 1)
	Director, Business Strategy	Future Frontiers (Part 2)
2017	Secretary, Department of Industry, Innovation and Science	Innovation Month 2017 Launch
2018	Secretary, Department of the Prime Minister and Cabinet	Innovation Month 2018 Launch
	Australian Public Service Commissioner	State of the Service - What it means for a professional, contemporary Public Service (Part 1)
	Group Manager, Workforce Information	State of the Service - What it means for a professional, contemporary Public Service (Part 2)

deemed sufficient to meet this requirement of purposive samples.

Because there is not always a close correlation between spoken language and behaviour, thematic analysis can be used as a process for finding the relation between textual messages and resulting actions performed by speakers (Nathan & Thomas, 2012). This empirical study addressed innovation from the leaders' perspective, reflecting upon their experience. Analysing the themes in archival records helps to gain insights from a unique perspective of leaders on how they regard an innovation agenda for the APS. The research question that guided this thematic analysis was: "What are the key drivers and barriers to innovation in the APS from senior managers' perspectives?"

A multi-step, multi-phase approach was employed to analyse the archival records using thematic analysis, as recommended by Braun and Clarke (2006). The first step focuses on data familiarisation to immerse the author in the data. To be included in the empirical data collection of the archival records, the recorded talks were viewed and reviewed to create the transcripts. In addition to the primary qualitative data, the author also reviewed relevant secondary data, such as official reports and websites. The empirical data were collected for investigating the contextual phenomena. The transcripts, in conjunction with documents, became part of the archival records. During this phase, these transcripts and documents were read without analysis or coding to gain an understanding of the content (Bryman & Bell, 2015). In the initial phase, the transcripts and documents were analysed to obtain a sense of the overarching theme of the presentation. Notes and initial ideas were developed for reference during the theme scanning.

The second step of the analysis was initial coding. Both the transcripts and documents were imported into the QSR NVivo 11. This step involved searching for interesting features in the data by utilising the highlighting tool to mark the text. The dominant

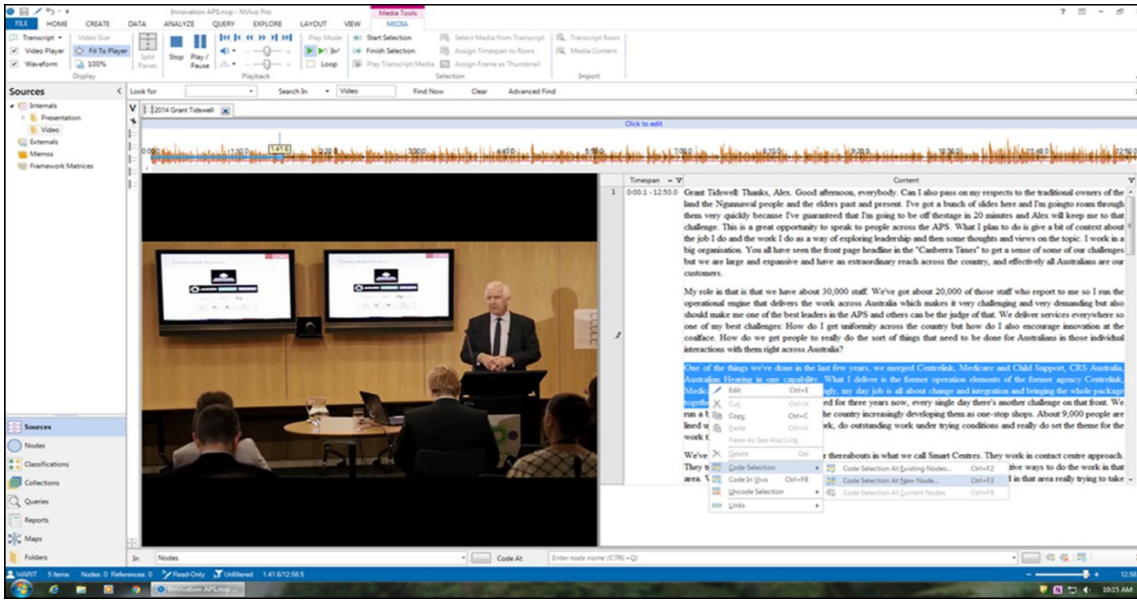

Fig. 1. Screenshot of coding in NVivo

words that emerged were coded in the NVivo nodes and sub-nodes with annotations assigned to signify their importance for later analysis. Coding was conducted to analyse the content and text from every manuscript, particularly those with similar values, intentions and meanings. As these words were grouped into codes during the text searches, preliminary extracts were each assigned a name and a definition. A screenshot of a coding activity is shown in Fig. 1.

Third, the respective coded segments were scrutinised and aggregated to develop themes and subthemes. The interpretative analysis was conducted to understand the meaning, sense and coherence of each theme and subtheme found in the archival records (Myers, 1994). An iterative process was deployed to confirm that there were no more potential themes and subthemes. This meant that the process reached theoretical saturation (Elison et al., 2014).

Finally, the list of possible themes and subthemes was revised and refined to ensure coherence within each theme and distinctness from other themes, confirming the criteria of internal homogeneity and external heterogeneity (Barnett et al., 2011). The themes and subthemes were reviewed to ensure that interpretation bias was minimised.

2. Results

There were some consistent patterns that emerged across speakers. Three salient themes emerged from the analysis of the speakers' transcripts, namely: innovation characteristics; drivers of innovation; and barriers to innovation. Each theme and its subthemes were discussed with a theoretical explanation and were supported by quotations extracted from the transcripts. Fig. 2 presents an overview of the themes and subthemes.

2.1. Innovation characteristics

Innovation now plays a pivotal role in improving service quality (i.e. developing ways to address better social problems to meet the demands of citizens) and raising the productivity of the public sector (i.e. increasing the efficiency and effectiveness with which budgets are spent) (Pärna, 2014). The following quote illustrates this: "Innovation is not something you can set and forget. It's something that we need to absolutely embed in the way we work. It shouldn't be just seen as an add on to our normal processes and thinking, not just in the policy area but also in the service delivery, program management and regulatory area and you'd see in terms of, the deregulation agenda, I think the government in particular is looking at us to look at more innovative ways to solving problems rather than just coming up with regulatory responses" (Secretary, Department of Industry).

Innovation characteristics could be determined by how innovations were developed and diffused within the organisation (Deschamps, 2005). Innovation in the public sector has long been

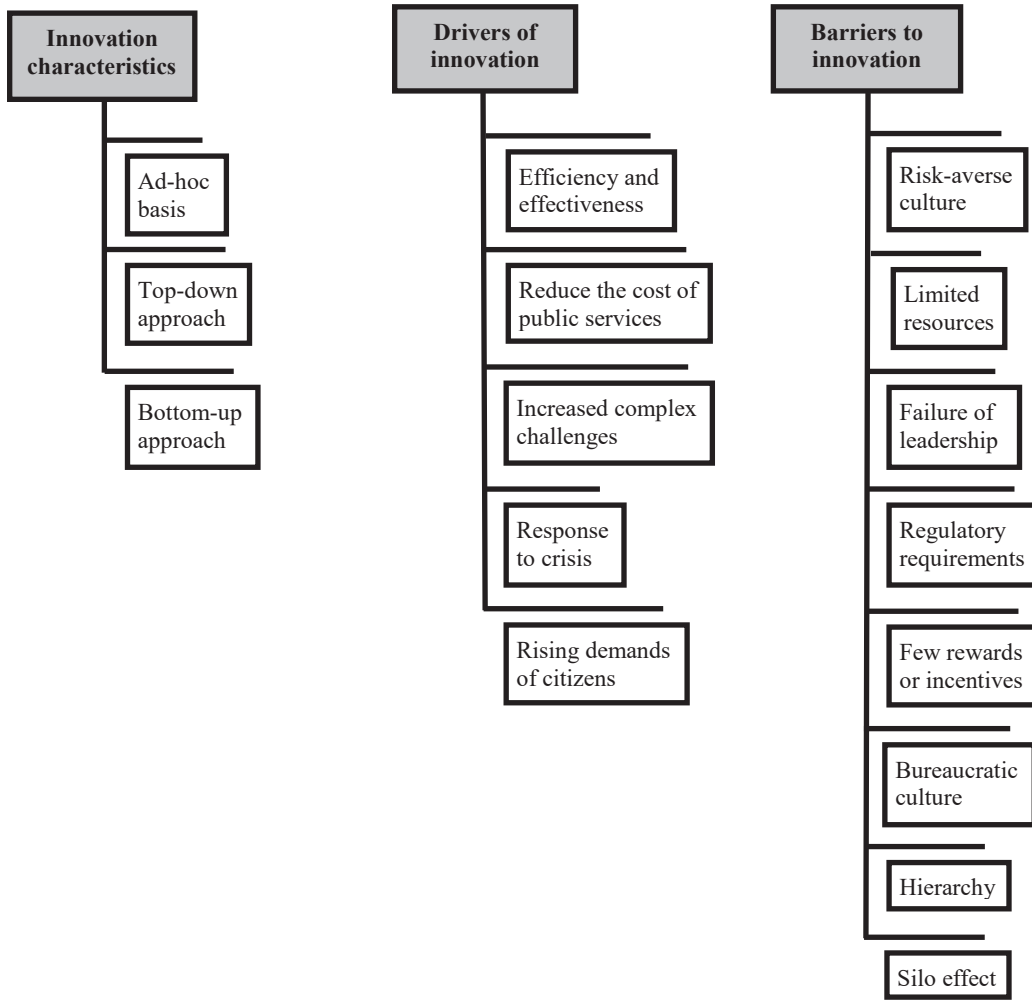

Fig. 2. Themes (shaded) and subthemes from the thematic analysis

considered 'ad-hoc' or even 'aberrant' (Bloch, 2010). Despite this perception, innovation in the public sector does occur mostly in terms of top-down and bottom-up approaches (Borins, 2006).

2.1.1. Ad-hoc basis

The relation between innovation and performance is much less clear in the public sector. Even though innovative projects are progressively stimulated in public sectors, they seem to be separated from routine works. Thus, an ad-hoc basis seems to be a characteristic of innovation in public sectors. One speaker indicated that an ad-hoc innovation was on the agenda at her agency. As she commented: "Innovation in the APS is often patchy and undertaken on a somewhat ad-hoc basis. And we didn't actually take them to sit down and have a look at what we were doing in total to convince us that we were doing quite a lot of innovative things" (Director General, IP Australia).

However, another speaker was more positive about this issue, offering the following solution: "We've very much taken an approach which says innovations in our department should not be about extracurricular activity. It's not about sort of small projects off to one side, it's about our core work" (Deputy Secretary, Department of Industry, Innovation and Science).

2.1.2. Top-down approach

This approach emphasises the leading role of top management who champion new ideas and support innovation. In addition, politicians also propose innovative ideas to spark media attention to their campaigns and to elicit the support of their constituents (Altshuler & Behn, 2010). The following two quotes illustrate the application of this top-down approach:

- "Each Department will clearly identify and support SES [Senior Executive Service] level cham-

pions, and my own Department's champion is at the deputy level. I'll be meeting with all the champions, straight after Innovation Month, to discuss how we can learn from each other, in helping to embed innovation, not just within our organisations, but across the APS" (Secretary, Department of Industry and Science).

- "One of my roles is to chair the APS Innovation Champions, which is a group of SES [Senior Executive Service], get together once a month, to share what's going on in our respective agencies, to try and build some peer support around Innovation across the APS. And we also try to push along a few key projects" (Deputy Secretary, Department of Industry, Innovation and Science).

Politics and the political process massively impact innovation in the public sector. The capability of the department to organise budgets to achieve innovative goals directly relies upon how the department obtains political support from parliamentary processes for scrutiny" (Golembiewski & Vigoda, 2000). The political shrewdness of civil servants can encourage innovation in their agency. These viewpoints are noted in the following: "Now if you go to your boss and say, I want to do this great, cool thing and it's going to be great and I'm going to go and work with all these other people. I'm going to spend lots of your money. Yeah, they're going to probably get a little nervous. If you say to him here's why this is going to be good for you, I want to make you look good, I want to achieve something great that's going to help our work, it's going to help our area, it's going to help our department, it's going to help our Minister. It aligns with all of these things; you're going to have a better chance of getting it through" (Director of Coordination and Gov 2.0).

2.1.3. Bottom-up approach

Research on innovation in the public sector has shown that while elected officials and senior managers conceive and initiate many innovations (Kellough & Nigro, 2002), frontline employees are also a source of many innovative proposals because they ingest ideas from outside the organisation or generate novel ideas developed through experimentation, accidental occurrences, and other forms of experience (Borins, 2006). Moreover, public servants who initiate innovations were more likely to be middle or lower-level bureaucrats in direct contact with clients rather than senior managers. Similarly, Borins (2006) has also found that frequent innovators in public sectors are career civil servants at the middle manager and frontline levels. For example, the following three quotes signal the importance of bottom-up innovation:

- "We know, I guess as leaders in the public service that the ideas aren't going to come from old us, old, crusty folk, they're going to come from younger people and the next wave of reform is going to come from those that are down the hierarchy" (Secretary, Department of Industry).
- "You really need to tackle innovation from the top down and then the bottom up. Innovation is not a separate activity, it's actually the way you go about your day-to-day job" (Director of Coordination and Gov 2.0).
- "We're also mindful that of course you've got to have bottom-up approach too and many of the good ideas that you'll have about changing the way we deliver services or new policies or new ways of doing things will come from our staff. So, we're developing what we're calling an ideas pathway for our staff. And, of course, we'll have an ideas management platform" (Deputy Secretary, Department of Industry, Innovation and Science).

2.2. Drivers of Innovation

Compared to the private sector, incentives for public servants are in general more likely to be much lower, and there are less performance-based material benefits, making it easier to avoid condemnation by not taking risks. The willingness to take risks is reduced because the ramifications that might occur include: political damage to the government, public criticism, possible legal consequences, diminished career prospects, and damage to personal reputation (Borins, 2006).

Nonetheless, innovation is no longer solely the realm of the private sector; it is also progressively adopted in the public sector (Setnikar & Petkovšek, 2013). In the private sector, achievement is conclusively evaluated with a combination of increased revenue, profits, and shareholder value; therefore innovation is essential (Bason, 2010). While the public sector is not subject to this competitive pressure to innovate and it is unnecessary to earn and maximise profit, innovation has still become an area of increased importance. Bloch (2010) also maintains the conception that unlike in the private sector, where innovation is basically driven by the purpose of profit

maximisation, public sector innovation focuses on maximising social welfare created through public investments. The drivers to innovation are referred to as the factors which create the fundamental impetus for adoption and implementation of innovations (Damanpour & Schneider, 2009). Among the drivers of public sector innovation, the most important are discussed in the below sections.

2.2.1. Improve efficiency and effectiveness

Innovation must be implemented to improve efficiency and effectiveness to increase public value (Langergaard & Scheuer, 2012). For instance, the Director General of IP Australia described: "Clearly, the application of new ideas and approaches, new technologies, and new systems of management that is innovation is essential to effectively making the challenges faced by the public sector and also to promoting Australia's general competitiveness and prosperity." In addition, the Secretary of the Department of Industry indicated that the focus on efficiency of resources is on the agenda in public sectors. As she commented: "I think in terms of innovation. It is absolutely a driver for productivity. The evidence is very clear. I think in terms of efficiencies in the public service, I think in the past, we've looked at doing the same with less [resources] in terms of efficiency". The Australian Public Service Commissioner also informed the audience about the important initiative for improving efficiency and effectiveness in the APS: "The Secretaries Board has created the APS Reform Committee to provide a focus on APS-wide initiatives that will work to achieve the objective of creating a more efficient, effective, productive and modern public service".

2.2.2. Reduce the cost of public services

Due to pressures on government revenues and rising expenses in areas of government service, substantial cost cutting must be accomplished to manage rising debt levels (Bason, 2010). Given that citizens expect greater public sector efficiency, embracing innovation is a potential solution for this demand. The Director of Coordination and Gov 2.0 stated that: "One of the main pressures I've noticed on government of course is around resources. Everyone has less to do more." The following quote is also evidence of this view: "It is our responsibility as public servants to be as efficient as we possibly can and cutting cost is a very real reason why we should be and needing to be innovative but innovation in that process that by definition is inefficient; any new idea or experiment may not work" (Secretary, Department of Industry).

"Innovation in the Australian Public Service is good for the budget bottom line – and it's making things easier and better for the public we serve"(Secretary, Department of the Prime Minister and Cabinet).

2.2.3. Increased complex challenges

The challenges arise in contexts such as education, sustainability and climate change, where the quality of problem-solving and institutional innovation has a primary impact on social, economic, and environmental capabilities (Kao, 2007). Moreover, the public sector has greater interests among stakeholders, and abstract social norms and objectives like safer roads, better public welfare and improved education. Thus, the public sector must cope with several stakeholders who may have contrary needs. Interpretation of this reflection should confront public sector innovation with highlighting conflictive objectives; therefore, drivers and barriers to innovation become blurred. This is an actual and perpetual core challenge to address through innovation behaviour support tools for public strategic decisions. Consequences of decision making in the public sector have to be shared among stakeholders and decisions have to be negotiated under expert pooling supervision. Thus, accountability of public sector decision in the context of innovation becomes paramount.

Balancing the needs of several stakeholders will have ramifications for their actions, outcomes, and the degree of trust in the public sector (Pärna, 2014). As discussed by one of the participants: "If government doesn't innovate, if we don't learn to be responsive and adaptive to what's happening in the world, then we make ourselves irrelevant. It's pretty simple, adapt or die. Without innovation, without trying to do things better or in a completely different way, we are not going to move forward" (Director, Digital Transformation Office).

2.2.4. Response to crisis

It is obvious that innovation is generated in the public sector in response to a crisis or some individual champions of a specific innovation (Eggers & Singh, 2009). For example, one presenter highlighted the

importance of crisis as a driver for innovation: "That crisis, you know I like to think, our crisis in Health, in the last little while has been the co-payment. Very publicly and politically difficult but we now have some very, very interesting ways forward around Medicare more broadly, and Primary Health Care. And we would not, probably, have got that opportunity without a crisis of a kind that allowed us to really push the boundaries on getting some real changed thinking around Medicare and Primary Health Care" (Secretary, Department of Health).

2.2.5. Rising demands of citizens

When comparing service quality in the private and public sectors, the public sector's lack of competitive pressure might not lead to incentives to improve service quality and respond to the demands of clients. The public sector must implement innovation to respond to the rising expectations of citizens as they compare public services with the improvements in service delivery accomplished by the private sector (Altshuler & Behn, 2010). Thus, citizens demand not only high quality and more user-centric services from the government but also services designed and often delivered in collaboration with citizens and community sector partners (Bowden, 2005). As highlighted by the Director General of IP Australia: "Citizen expectations of public service quality have risen while at the same time there is an increasing pressure on public budgets for greater efficiency, productivity, and cost reductions. There is also increasing contestability in the provision of public services and even policy advice." Similarly, the Director of Coordination and Gov 2.0 argued that: "A citizen today is able to engage and if you're not responsive to them, if government don't be agile and actually fill up a role then that void gets picked up by other people, so the internet society is a major pressure of the changing expectations of the public that we serve is a major pressure". This key driver was also confirmed by these speakers:

- "Really, it is a core function for all of us, and essential in terms of us meeting the demands of an ever-hungry public for better Public Services" (Deputy Secretary, Department of Industry, Innovation, and Science);
- I think we have an opportunity to better understand citizen attitudes and satisfaction with the APS, and to contribute to a 'citizen-centred' APS culture" (Secretary, Department of the Prime Minister and Cabinet).

2.3. Barriers to innovation

It is significant also to highlight the barriers to innovation in the public sector which have to be addressed to maintain successful and systemic innovation. Barriers to innovation are defined as impediments that delay agencies to adopt or implement innovations successfully (Demircioglu, 2018). Most barriers appear in the context of organisational, political, economic, and social aspects. Borins (2006) divides the barriers in public sectors into three groups: (1) political barriers, arising in the political environment; (2) internal barriers, arising within the organisation; and (3) external barriers caused by the external environment. The internal barriers include; a lack of sufficient human or financial resources, little management support, few incentives for staff, staff resistance and a risk-averse culture. The external barriers include regulatory obligations and an ambiguous acceptance by clients. Based on the thematic analysis of the presentation transcripts, the following factors function as significant barriers to innovation in the public sector:

2.3.1. Risk-averse culture

The public sector is regarded as risk-averse (Koch & Hauknes, 2005). The duty to maintain continuity and provide acceptable standardised services and accountability to citizens are subject to the possibility of political and media criticism when policies or programs seem unsuccessful (Mulgan & Albury, 2003). The negative ramifications of risk-taking in the public sector can be drastic and can include "political damage to the government, public criticism, possible legal consequences, diminished career prospects, and damage to personal reputation" (Management Advisory Committee [MAC], 2010, p. 30). Therefore, these reasons often lead to a culture of risk aversion which hampers innovation and again accentuates the need to deliberately manage innovation in the public sector. Some speakers indicated that a culture of risk aversion is a major barrier for innovation:

- "I think risk is one of the first things that come to mind for many. The public service is often described as risk averse, yet risk is intrinsic part of innovation" (Secretary, Department of Industry).
- "Our stewardship of critical public sectors services and activities rightly attracts close scrutiny by parliament, the media, and the public. And we operate to serve ministers in a political environ-

ment. Tolerance for risk and failure is limited" (Director General, IP Australia).

The following comments made by one speaker, reflecting on conversations she has had with other civil servants, illustrate risk-aversion: "The amount of people that have said to me, just quietly, small feedback up, Hey, we'd love to do that, but we don't want to get any criticism" (Director of Coordination and Gov 2.0).

2.3.2. Limited resources

To drive a successful innovation implementation, organisations require human and financial resources. However, the APS is often confronted with skills shortages in their workforce and budgetary constraints, as reflected in this comment: "The APS faces discrete skills shortages; we have an ageing population and a fiercely competitive labour market. All of which are situated within a tight fiscal environment that continues to demand seamless service delivery" (Group Manager, Workforce Information).

Financial resources are also essential for innovative project development, testing and implementation. Strict funding in public management is a vital issue caused by the alignment of centralisation and decentralisation doctrines and aspects of power in regard to government level (Page, 2005). The public sector also has a duty to utilise resources effectively. Innovation is normally funded using budgetary slack or cost savings brought about by enhanced efficiency. However, the obstacle with these budgets is that they are unpredictable (Borins, 2006). Moreover, innovation normally cannot break even within the short-term horizon. Thus, public servants hesitate to integrate innovation initiatives into resource planning due to concerns that such cost will be considered too risky and funds should be allotted to other items.

However, one speaker put forward the view that limited resources were both positive and negative for innovation: "Resources themselves can also have a positive or negative effect. Resource cuts can in fact stimulate innovation by requiring us to rethink how we can achieve the outcome with fewer inputs. Conversely in some cases innovation will require an investment of resources and it can be strangled if there are none available" (Director General, IP Australia).

Overcoming limited resources could be done by the recommendation of one speaker: "Don't let budget-constrained environments that many of us work in get in the way of you making change. Start small, pilot your ideas, but also keep the bigger picture in mind. Be ready to scale up when the time is right" (Director, Business Strategy).

2.3.3. Failure of leadership

Organisational leadership plays an important role in facilitating innovation by creating a climate in which subordinates interact and operate as reflected in a comment from the Secretary of Department of Infrastructure and Regional Development: "SES [Senior Executive Service] leadership is undoubtedly a key success factor. Engaging SES and requiring outcomes at that level is a challenge for me personally". Top management's commitment to the culture and attitudes toward innovation can be demonstrated by a willingness to accept the risk and advocating and rewarding innovative behaviour. Leaders must find mechanisms to encourage the generation, adoption, and implementation of innovations. For example, as noted in the following comment, the failure of leadership has been a vital barrier to innovation: "The third pressure is upper management. They don't always get what we're trying to do. Let's be honest, right?" (Director of Coordination and Gov 2.0).

Nevertheless, frequent changes in organisational leaders occurring from the exchange of political forces or the end of terms of office are major barriers of innovation processes in the public sector. This phenomenon is called the 'too many hats' syndrome (Raipa & Giedraityte, 2014). Frequent leadership changes make it difficult to start innovative projects and drive change and innovation in the public sector (Hamson, 2004).

2.3.4. Regulatory requirements

Approval processes in the public sector are heavily controlled by regulations and laws which can be embedded and burdensome. Activities in such organisations are also administrated by common, abstract, and clearly defined regulations and policies which exclude requirements for issuance of specific mandates for each unique case (Borins, 2006). To be successful, innovation processes require 'breaking the rules' (Mulgan & Albury, 2003). In addition, many public sectors are confronted with legal requirements. More regulations do not automatically assure better discipline. Therefore, the red tape of the past should have no place in the innovative organisation. Instead, organisations need to ensure that standards are up to date and provide appropriate regulations to enable

ideas to be taken to citizens. The following quotes illustrate this:

"Inherit conservatism, rigid and opaque processes and structures breed a culture of conformity and punish non-conformity. A closed internal focus assumes that all of the answers must come from within. Our roles require a high degree of public accountability and thus working within a sometimes restrictive rules-based framework is inevitable" (Director General, IP Australia).

2.3.5. Few rewards or incentives

The public sector has generally had higher punishments for failed innovation than rewards for successful ones. While public servants may attempt to be creative and innovative, there is scarce feedback on ideas. Innovative projects are rarely encouraged, and there is a lack of recognition of innovators. In some agencies, processes or attitudes tend to punish innovators by transferring the risk of failure onto them. Also, departments seeking to generate innovation may have to fund the project internally. Although implementing innovation can reduce the operating cost for the organisations, but the reward is that their annual budgets are curtailed in the subsequent fiscal year. Moreover, if the innovation fails or does not prove to be efficient, the innovators are responsible for all the costs. Such experiences lead public servants to the perspective that any innovative initiatives are confronted with the risk of penalties (Management Advisory Committee [MAC], 2010). Another presenter expressed concern about too few rewards in public sectors, leading to a belief that innovation is not valued in their organisations: "Undertaking innovation in the APS has been described as long on risk and short on reward. There are those that say that the APS risk-reward trade-off is currently low on risk and short on reward. To promote innovation, the staff need to understand that it is valued within the organisation" (Director General, IP Australia).

2.3.6. Bureaucratic culture

Public sectors generally have a bureaucratic organisational structure. Bureaucracy relates to the precise separation of integrated activities regarded as responsibilities inherent in the department and hierarchical management based on supervisory relationships (Raipa & Giedraityte, 2014). Public sectors are also characterised by a bureaucratic culture, based on standardisation and formalisation of work processes. The bureaucratic culture which also associates with a legal chain of command and control could reduce and hinder the leeway for innovation (Evans & Burger, 2016). Bureaucracies often restrain innovation because of their inherent proclivity toward regulation and certainty (Golembiewski & Vigoda, 2000). As one speaker from a high-ranking position commented: "I think the Secretaries' Group want to see new ideas not being put through big bureaucratic processes, but absolutely streamlined across the [Australian] Public Service, and that does, absolutely, require leadership, not just through Secretaries and SES [Senior Executive Service], but all of us, to help loosen, I guess, the bureaucracy and the shackles that seem to maintain a business as usual approach, and, if we don't keep up, then we become less relevant, too, as Agencies and the Public Sector" (Secretary, Department of Industry and Science).

2.3.7. Hierarchy

Highly hierarchical organisations thwart innovation in the public sector, and senior officers may hold the opinion that innovation can result in threats to existing hierarchies. There is a perception amongst many public servants that seniority or position generally rules whose opinions are accepted or respected. A host of internal hierarchy horizontal constraints tend to inhibit the interaction necessary to generate novel ideas, and vertical barriers can hamper novel ideas from bubbling up to the determination (Eggers & Singh, 2009). In hierarchical structures, novel ideas have to pass through many steps of approval processes (Management Advisory Committee [MAC], 2010).

The Secretary of Department of Industry and Science emphasised hierarchy as the most critical barrier in public sectors: "A perennial feature of the public service is its hierarchy and the call of authority to those higher up. This might sound a bit strange coming from me as a Secretary, but I am all too aware that this sort of work culture is actually one of the biggest barriers to innovation, and I have said that in the past, in terms of the hierarchy being probably the biggest barrier to innovation across the Australian Public Service."

However, not every speaker viewed hierarchy negatively, with one speaker taking a more longitudinal and broader perspective, commenting as follows: "Now, I know that people sometimes don't associate hierarchy with innovation, but I'm a great

believer in hierarchy. I spent 22 years in the army with an appreciation that sometimes you have to do what you're told. The advantage of hierarchy is that often it comes with relatively large spans of command, spans of control. Lots of people, people with lots of direct reports. Typically, the research shows you that between five and seven is the right number of direct reports that you can get. Now, what's the advantage of having seven direct reports as opposed to one or two direct reports? Bloody hard to micromanage seven people, and if you avoid micromanagement, you avoid the innovation-crushing way of telling people how to do things" (Chief Technology Officer, Department of Finance).

In order to stimulate an innovative idea, flatter structures and more open, interactive processes should be established in the public sector.

2.3.8. Silo effect

The public sector has a tendency to operate like a silo where each department has different duties and the authority to operate the duty. Initially, these are generated as a procedure to manage human resources and structural processes. However, the issue with silos is that they cause public servants to only concentrate on the specific mission of their agency. Generally, there is an implicit race between departments, especially where their duties overlap (Management Advisory Committee [MAC], 2010). These silos can be a significant barrier in terms of collaboration between each agency. The major obstacles to innovation result not from deficiencies of individual talent but from deficiencies of collaboration. As highlighted by one of the speakers: "This massive barrier to doing the work of the public service better is systemic silos. This is how government sees government, a whole map of fiefdoms, of castles to defend, of armies that are beating at your door, people trying to take your food, and this is just one department. We don't have this concept of that flag has these skills that we could use. These people are doing this project; here's this fantastic thing happening over there that we could chat to. We're not doing that enough across departments, across jurisdictions. So, what's the solution? The solution is we need to share" (Director of Coordination and Gov 2.0).

The public sector must disintegrate the silos that obstruct the flow of information that becomes knowledge, informed decisions and leads to results (Eggers & Singh, 2009). To solve the silo effect, the Secretary to the Department of Industry, Innovation and Science suggested: "We must reset it, from one of silos to one of collaboration". As explained by another speaker who believed that his agency had overcome the silo problem by idea sharing: "We've committed to idea sharing by supporting a trial of a cross-agency platform. Increasingly, we are experiencing convergence of issues and the citizen's view and experience of government is not siloed, and nor will the solutions to their needs be. Silos are becoming less important, while integration and collaboration are becoming more so" (Secretary, Department of Industry and Science).

Conclusion and discussion

Value creation in the public sector is much broader in scope than for private businesses (Kelly et al., 2002). Four types of values for the public sector are proposed by Bason (2010): productivity, service experience, results, and democracy. The obstacle for the public sector is that value in all four categories has to be established simultaneously, without impairing the value of another. Thus, the special role and function of the public sector are subject to a democratic rule, in which democracy is the governing principle. Public sector innovation is considered a legitimate means to improve efficiency and effectiveness in government and respond to citizens' increasing demand for better services. Public agencies are becoming key players in the adoption, invention and implementation of innovations (Borins, 2006).

Having conducted a comprehensive thematic analysis, this study has identified how senior managers view innovation in the APS from different standpoints. The main context of this study has been to transition research on innovation into an applied public sector setting. The thematic analysis revealed that the three key attributes typically associated with public sector innovation in the APS consist of innovation characteristics, drivers of innovation, and barriers of innovation. These aspects have been defined, and descriptors assigned. There is a stereotypical view of the APS as being large bureaucracies which stifle innovation. Despite this perception, innovation in the APS does occur both in terms of a top-down approach and also a bottom-up approach. A consensus on the definition of innovation offers a way forward for the identification of innovation within the public sector context. For

example, there is the opportunity to characterise innovation based on whether civil servants bring forward new ideas or improve an existing aspect of the APS.

Innovation in the APS has rapidly increased due to several drivers such as the requirement for improved efficiency and effectiveness; a reduced cost of public services; increased complex challenges; and the rising demands of citizens. This finding is consistent with Altshuler and Behn (2010)'s study which highlighted the critical roles of the rising expectations of citizens and dramatic cost-cutting agenda fostering innovation in public sector organisations. The public sector must implement innovation to respond to the rising expectations of citizens as they are increasingly comparing public services with improvements in service delivery accomplished by the private sector. Governments generally aim to achieve dramatic cost-cutting to manage rising debt levels. Given that citizens expect greater public sector efficiency, embracing innovation is a potential solution for this demand.

This study provides insights for the APS to focus on barriers to innovation in their workplace. The main barriers highlighted by speakers were a risk-averse culture, limited resources, failure of leadership, regulatory requirements, and few rewards or incentives. Additional key concerns expressed by senior managers included hierarchy, bureaucratic culture and the silo effect. The most important barrier is a risk-averse culture which is in line with the conclusion by Koch and Hauknes (2005) stating that the public sector is regarded as risk-averse. A potential solution could be adopting a risk management approach as the Secretary of the Department of Health proposed: "We need to look at our risk management approach to support the growth in innovation within your organisations. It means we look at-risk, we understand it, we manage it, and we adapt ourselves to live within that framework."

A supportive environment is described as one where employees have the freedom to experiment and take the necessary risks to pursue new ideas and where failure is an acceptable outcome. This finding is consistent with a study by Demircioglu and Audretsch (2017) which has also demonstrated that creative contributions require contexts of psychological safety and freedom, well separated from a blame culture. Innovative attempts should be recognised for both successful and unsuccessful results. In summary, strategic leaders must provide supportive and independent environments, as well as time and resources according to the required demands.

The limitation of this study is that the evidence was based on the perceptions of speakers that were mainly senior executives of the APS and may not reflect the perceptions of the broader APS community. This study was also based on archival analysis, which limits the extent to which findings can be generalised. However, study findings provide a solid foundation for conducting future research on related topics. A quantitative research approach, particularly statistical analysis, should also be conducted to complement this qualitative study, in order to deeply investigate the extent of the impact of each of these drivers and barriers towards the innovation agenda of the APS.

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The moderating role of risk management in project planning and project success: evidence from construction businesses of Pakistan and the UK

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ABSTRACT

This comparative study examines the moderating role of risk management in project planning and project success in the construction business of the UK and Pakistan. The data was gathered from 152 project managers (76 from both economies each) using a survey questionnaire. The purposive sampling technique was used to ensure fair representation of sample size and the RAND formula was used to select the project managers. For quantitative analysis, partial least square structural equation modelling technique was utilised. The results confirmed that project planning had a statistically significant impact on project success. Furthermore, risk management significantly moderated the relationship between project planning and project success in the construction businesses despite being in two different economies. The paper contributes to the enhancement of the body of knowledge intended for global companies and academicians aiming to implement risk management frameworks to enhance project success and ensure the effectiveness of project planning in a competitive business environment. It offers a new perspective to investigate the relationship between project planning and project success through moderating the effect of risk management, which is a new theoretical dimension for construction business and the field of project management. It is proposed to the governments and construction businesses operating in the UK and Pakistan to validate the empirical research framework in the cross-cultural context while assessing risk and uncertainty. It helps the construction business in the evaluation of risk while planning and successfully implementing project strategies.

KEY WORDS

project planning, project success, risk management, construction business, contrasting economies

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Introduction

The construction industry has a significant role in the economic growth and development of the national economy (Dakhil, 2013). The construction industry is mainly significant because of its contribution to the economy (Dakhil, 2013). Nevertheless, the contribution and role of construction businesses significantly vary from one economy to another (Khan, 2008). In the context of emerging economies, the construction industry is a sector that makes an important contribution by developing new infrastructure and buildings, e.g., airports, housing, schools, roads, railways, new hospitals and others (Khan, 2008). On the other hand, in developed economies, the construction industry has a more holistic role due to a greater

emphasis on the provision of professional services as well as repair and maintenance construction (Bon & Bietroforte, 1999; Ruddock, 2009). Nevertheless, the construction industry is also significant in the creation of employment while offering billions of job opportunities in both developed and emerging economies (Dakhil, 2013; UK Government Construction Strategy, 2011; Khan, 2008). In the UK, the construction industry's contribution to the gross domestic product (GDP) is 7% while the annual output is over GBP 110 billion (British Innovation & Skills - BIS, 2013). Moreover, 60% of the UK construction industry is involved in new building whilst 40% is engaged in maintenance and refurbishment (BIS, 2013). Interestingly, the construction industry of the UK creates 2030,000 contractual jobs and 234,000 permanent jobs. On the other hand, in Pakistan, the contribution of the construction sector towards GDP is 2.3% with the annual growth of 5.2% and approx. 5.5% of the total employed labour force (PSDF, 2013). The economic growth in Pakistan is escalated by over 100,000 employees holding contractual and permanent jobs created by the construction industry (Khan & Gul, 2017). Gradual growth in the construction businesses is achieved by massive investments in Pakistan from China–Pakistan Economic Corridor Project (CPEC) (Gazder & Khan, 2018). As a result, Hawksbay, Karachi received approx. USD 60 billion in investments while another USD 43 billion went to Bin Qasim (Gazder & Khan, 2018). Also, Naya Pakistan Housing Scheme project has started offering over five million houses in the entire country, which will increase job opportunities as well as promote construction business across the country (Wasim, 2018).

Project success and performance to a greater extent depend on planning; therefore, it plays a pivotal role during the phases of project formation (Naeem et al., 2018). Idoro (2012) argues that planning is a thorough continuous process for delivering a project. Many empirical studies regarding success factors of project management indicated planning as the key contributor towards project success (Aronson & Lechlier, 2009; Murphy et al., 1974; Slevin & Pinto, 1987). Interestingly, Dvira, Razb & Shenharc (2002) explain that the formulation of a solid project plan is required by all project managers in order to succeed in the project.

Prabhakar (2009) argues that project success is one of the most important areas within the project management discipline. Muller and Jugdev (2012) explain several factors that determine the project success such as a type of project, the contract duration and an individual's role within the project. On the other hand, Baccarini (1991) argues that project success contains two parts, namely, product success and project management success. Interpersonal trust and institutional trust (Ejdys, 2018) could be effective in project planning, project success and risk management.

Rabechini and de Carvalho (2013) state that in professional project management, risk is attributed to one of the major concerns, particularly, after the global financial crisis of 2008. Risk associated with a project it is termed project risk, which often reflects the project's unfavourable state (Zhang, 2007). Parker and Mobey (2004) argue that no matter how many measures are considered, no type of project comes with a guarantee as even the most carefully planned tasks face obstacles and problems. Due to the uncertain environment, even the simplest activity could encounter unexpected problems, which may alter the project activity despite all the proper precautions taken by the project manager (Parker & Mobey, 2004). "Project risk management is regarded as a process that accompanies the project from its definition through its planning, execution and control phases up to its completion and closure" (Raz & Michael, 2001, pp. 9-17). Additionally, the anticipated outcomes are a risk management measure through decision milestones that prevents sequential frustration and disaster so that available resources are utilised most effectively. However, projects still encounter budget overruns, schedule delays and compromised specifications (Meyer et al., 2017). Ejdys and Halicka (2018) argue that a positive attitude reflects the readiness to learn. This could be effective in adequately assessing risk and planning.

Past research studies confirmed that planning should be the prime focus of project management teams to improve performance (Lemma, 2014). Additionally, the work by Ahmed (2012) confirmed that the management plan was positively affected by organisational efficiency in those organisations that incorporate risk management and planning while implementing management practices. The present study offers a solution to construction businesses operating in private or public domains. The recommendations of this study offer effective means for planning while reducing the project risk. The outcomes of present research may also assist construction businesses in the development of project plans and risk management skills to ensure project

Tab. 1. Structure of the current research segments

Literature review	This section contains the critical discussion regarding the research variables, namely, project planning, project success and risk management. Additionally, this section identifies gaps in the literature to develop research hypotheses
Research framework and hypotheses	Based on the earlier review of the literature, a conceptual and theoretical model is presented along with the research hypotheses. The hypotheses mainly explain the relationship between project planning and project success together with the moderating effect of risk management
Research methodology	The adopted strategies and techniques undertaken in this study are explained in this section. It offers the justification for the selection of the sample size, the instrument and data analysis techniques
Results and data analysis	This section contains a measurement model and a structural model. As the first step, the validity of the measurement model is assessed using Cronbach's alpha, composite reliability, AVE and Fornell-Larcker test. Once the validity of the model is confirmed, the structural model is used to test the research hypotheses using a path coefficient. It also contains the variability assessment and the effect that the size of latent variables has on the endogenous variable. The results showed a significant relationship between project planning and project success as well as the moderating effect of risk management on considered variables
Findings and discussion	This part contains findings and discussion regarding the obtained results and their analysis in the light of available literature. It includes the confirmation or rejection of previous findings
Conclusion and recommendation	The last section draws the logical conclusion about the relationship. It also provides the recommendations for construction businesses together with guidelines for researchers to validate the theoretical framework as well as attain broader generalizability

success in a competitive business environment. There are traces of the mediation role of risk management in the construction industry of emerging economies (Khan, 2008; Naeem et al., 2018); however, through a comparative lens, the researched area considers the moderating role of risk management in relation to project planning and project success. Additionally, the present research focuses on the impact project planning has on performance while considering the moderating effect of risk management on the project success, which has not been addressed previously by researchers. Several papers contain a discussion regarding the project planning and risk management as pivotal attributes of project success. However, the discussions did not consider the moderating effect of risk management in relation to project planning and project success. Furthermore, the discussions remained limited to regional specifics while there was no evidence from the contrasting economies to indicate that the moderating effect varied in distinctive types of economies. Thereby, this study compares countries the Western Europe and South Asia in terms of the moderating role of risk management in project planning and success.

1. Literature review

1.1. Project success

Various authors define project management looking through an operational and conceptual lens (de Carvalho & Rabechini, 2017; Pinto & Pinto, 1991; Wu, Liu, Zhao & Zuo, 2017). According to Pinto and Pinto (1991), the satisfaction of customers, time, cost and quality are all parts of project success. On the other hand, Carvalho and Rabechini (2017) indicate three aspects in the definition of project success, namely, (a) an impact of the project on the business, client and staff, (b) the project efficiency, and (c) the preparation for the future. Interestingly, Wu et al. (2017) explained it comprehensively by stating that "it involves the quality, cost, time, health & safety, environmental control, the satisfaction of participants, users and commercial values" (pp. 1466-1482). "There are various factors affecting project success that affect the contractual flexibility" (Wu et al., 2018, pp. 1039-1061). Nevertheless, several studies have investigated the project success through work bulling, corporate reputation, emotional intelligence, entrepreneurial orientation, team learning, corporate reputation, innovation and human resource practices (Creasy & Carnes, 2017; Dakhil, 2013; Irfan

& Hassan, 2017; Martens et al., 2018; Naeem et al., 2018; Rezvani et al., 2016; Yang et al., 2015). Specifically, the present study mainly focused on the moderating effect of risk management on the relationship between project planning and project success. Hence, it considered the work by Pare et al., (2008) that looked into different types of risk associated with project success, including technological risk, human risk and strategic risk. While analysing risk management, all three aspects of risk were considered.

1.2. Linkage between project planning and Project Success

According to Naeem et al. (2018), the desire of an administrator, team worker, designer, organiser, proprietor, or any other member to reach an outcome reflects the success of a project. On the other hand, it is generally hinted that project success means attaining an outcome that is either better than expected or usually realised as far as to achieve member fulfilment and security assurance, while quality and cost are managed with good results (Ashley et al., 1987). Interestingly, "a project is viewed as a general success on the off chance that it meets the specialized execution specification or potentially mission to be performed, and if there is an abnormal state of fulfilment concerning the project's result among key individuals in the parent association, enter individuals in the project group and key clients or customers of the project exertion" (de Wit, 1988; cited from Naeem et al., 2018, pp. 88-98). On the other hand, Sanvido et al. (1992) argue that the project objectives and actual desires are aligned, reflecting the success of a project. This indicates that project success is connected to adequate planning. Furthermore, the desires and objectives incorporate various angles including social, financial, expert and instructive (Sanvido et al., 1992). Several studies confirmed the positive effect of the project anticipation on the project success (Murphy et al., 1974; Naeem et al., 2018).

Cleland and Ireland (2006) explain that, "the process of planning through what's more, making unequivocal the targets, objectives, and procedures important to bring the project through its lifecycle to a fruitful end when the project's item, management, or process assumes its legitimate position in the execution of project proprietor methodologies" (cited from Naeem et al., 2018, pp. 88-98). Several authors have investigated broader possibilities, which impact on project success to any extent (Zwikael et al., 2014). Project success is significantly affected by the planning and adoption of the standard purpose and procedures related to project lifecycle (Rahrovani, Chan & Pinsonneault, 2014). Project success is possibility enhanced using required assets, project training and arrangements and deciding upon ideal strategies that are part of the project planning process (Naeem et al., 2018). Also, Galvin et al., (2014) state that the set targets are achieved by a project that follows extended planning in the conceptualised stage to the execution point. The results of a project are affected by adequate selection of options in the planning procedure (Arditi, 1985; Naeem et al., 2018). Interestingly, hierarchical strategies, internal operations, administrations, and devising new components are the areas where project planning could be utilised (Nutt, 1982; Nutt, 1983). Nevertheless, Naeem et al. (2018) also found that project success was often the result of extraordinary strategic planning during the project process. Nevertheless, it is particularly problematic or even challenging to understand precisely at the fundamental planning phase what should be considered or discarded during the process to complete the project while considering the cost and duration parameters (Andersen, 1996). Hence, there is evidence attesting to the relationship between project planning and project success.

1.3. Linkage between risk management and project success

Project risk is associated with all phases of project planning. It is often used to demonstrate a plausible or difficult situation of a project (Naeem et al., 2018). At the same time, it additionally has a propensity to be an errand related or objective-related idea (Naeem et al., 2018). A project can be perceived as a short-term framework (or linkage) that is arranged to complete tasks or attain specific objectives (Lundin, 1995; Packendorff, 1995; Turner, 2006). The importance of project risk cannot be avoided while considering the framework. Besides, a project risk may be considered as a feasible troubling effect that may give rise to a challenge in the attainment of framework objectives, for instance, quality, arrangements, etc. (Naeem et al., 2018). Zhang (2007) found that the recognition of the importance of project risk attested to the ability of project management to handle divergence from pre-defined objectives. Interestingly, Duncan (2005) explained

project risk as, a "dubious project chance occasion or condition that, on the off chance that it happens, has a positive or negative impact on a project's targets" (pp. 03-216). On the other hand, Datta and Mukerjee (2001) argued that successful project completion depended to a great extent on the early identification of immediate risks. Constructively, there are numerous variables that predict and determine the success of a project. Nonetheless, it is still evident that negligence towards appropriate consideration of risk management increases the chances of disappointment or failure (Naeem et al., 2018). The well-known aphorism "failing to plan is planning to fail" is assumed to pertain to dangers. So, it is necessary to adopt a convincing strategy for coping with uncertainties and extended dangers, which would be easily understood by the project group as well as used and implemented (Carbone & Tippett, 2004).

1.4. Linkage between project planning and project risk management

The expansion of a project in size and multifaceted nature and, thus, the adoption of a multidimensional strategy for project management necessitate adequate consideration of risk management (Naeem et al., 2018). According to Carbone and Tippett (2004), the success of a project as well as the chances of effectively overseeing project operations increase using a basic hazard management instrument. Encompassing all interlinked risks, risk management aims to ensure the success of a project. Support should be set on differentiating the shortcomings of a plan or concept. Several studies confirmed that at the stage where possibility evaluations are assigned based on a fair and specific requirement for data, they have a propensity to be effectively used to reduce physical and financial hazard (Ramirez-Cortés et al., 2012; Naeem et al., 2018). Likewise, as with the Input–Transformation–Output process, the obligation of risk management for catching advantages ought to be appointed to a particular individual (Zwikael & Smyrk, 2012), the project supervisor should oversee project possibilities as planned, yet should not be held accountable for obtaining the standard benefits from it. Interestingly, project success is regarded as a notion that has been found vaguely defined within the literature related to project management as well as from the perspective of a project manager's psyche. Objectives have usually been expressed as a triangle that reflects quality, cost and time.

This is an invaluable instructive and sophisticated instrument that simply reveals how a shift within any of the attributes of the triangle impacts on the remaining two components (Slevin & Pinto, 1986). Strategizing the structural development process entails presuming what should be done, who should complete the task and the approximate time for the completion of the task. Specifically, time, cost and staff assets required for project execution and exertion are part of project planning. Furthermore, planning requires several activities, for instance, strategizing distinctive deliverables and focuses of a survey, that depend on the phases of progression, which provides a conventional structure to the project (Ratcliff, 1987). Several studies related to project management success attribute recommended planning as the key factor of the success of a project (Aronson & Lechler, 2009; Murphy et al., 1974; Slevin & Pinto, 1987). The literature reflects the association between project risk management and project planning.

1.5. Moderating role of risk management

"Project risk management is a continuous process of identifying, analysing, organizing and moderating dangers that debilitate an activity's probability of success regarding cost, plan, quality, wellbeing and specialized execution" (Naeem et al., 2018, pp. 88-98). Associations and managers frequently contemplate broadened risk management practices as 'nice to have' within a project as opposed to centralised project control. Whilst deciding upon project-related significant risk and associated needs, it is important to construct arrangements related to risk control capabilities to limit the controlled risk. The primary stage in the process is to construct a risk administration layout that explains the practices essential to bringing risk-related aspects under control so that the project could be successfully moving forward and be completed (Boehm, 1991). The major objective of employing project risk management is the enhancement of organisational value (Dalcher, 2012). "The social and geological separation produced by seaward outsourcing, the essential issue to consider is how social contrasts influence project's successful management that navigate sideways over traditions. Exactly, multifaceted issues are almost certainly going to wind up particularly an important component, as they have in the administration of global joint tasks that helps in projects to be successful" (Brannen & Salk, 2000, pp. 451-487). Similarly, risk factors and

their impact on project success could be identified in relation to cost, time, quality, safety and environmental sustainability (Zehra & Faizan, 2017).

Hence, the literature indicates that pre-planning risk management moderates the relationship between project planning and project success. Nevertheless, project risk management is regarded as a continuous process related to identifying, analysing, organising as well as moderating risks that adversely affect the likelihood of project success concerning quality, plan, cost and professional execution (Naeem et al., 2016). Interestingly, previous studies confirmed planning as the most critical factor for project success (Pinto & Slevin, 1989; Naeem et al., 2018). Also, the responsibility of successful operation lies with the project manager, who, therefore, must ensure that all the operations are legitimately carried out and completed entirely by every single relevant collaborator (Meredith & Mantel, 1995; Naeem et al., 2018; Pinto & Slevin, 1989). The expected critical impact of corporate planning has been recognised only by some projects, depending on nature and situations (Ramanujam & Venkatraman, 1986; Rhyne, 1986). Interestingly, Armstrong (1982) found that only ten out of fifteen experimental reports confirmed that formal planning activities gave rise to significant changes in operations. On the other hand, the results in relation to the impact of anticipated project success are considerably less ambiguous. The review of 44 studies on the success factor of project management found only thirteen studies that confirmed the impact of project planning as significant on the project success in the presence of different types of risks (Gemuenden & Lechler, 1997).

2. Research framework and hypotheses

Based on the review of the available literature, the research framework for this study was made (Fig. 1).

Based on the literature review, the following hypotheses were formulated:

H1: There is a positive linkage between project planning and project success.

H2: There is a positive linkage between risk management and project success.

H3: Risk management moderates the relationship between project planning and project success.

3. Research methodology

In this study, a survey questionnaire was circulated in different construction businesses operating in Pakistan and the UK selected using the purposive (non-probability) sampling technique. In cross-sectional research design, purposive sampling is more appropriate for sub-groups as it offers a fair representation of the target audience (Haque, Aston & Kozlovski, 2018). Thus, purposive sampling was considered to have equal representation in both economies. The total of 152 project managers (76 from Pakistan and the UK each) were approached, and the response rate was 37.25%.

Moreover, following the strategy by Imran, Jian, Haque, Urbanski and Nair (2018), with the help of Microsoft Excel 2016 RAND function, respondents were randomly chosen from the list of selected organisations. The questionnaire contained four sections. Data for project success, project planning and project risk management were assessed on 5-point Likert scale (1=Strongly Disagree, 2=Disagree, 3=Neither Agree nor Disagree, 4=Agree, 5=Strongly Agree). The medium of instruction of the questionnaire was English as it is the mandatory language used in education in both countries. The first section contains questions related to demographic information, including age, experience and qualification. Followed by the section asking questions regarding research project planning, project risk management and, lastly, project success. This study considered four

Fig. 1. Research framework of the current study

items for measuring project success of the PIP scale by Pinto and Prescott PIP (1998), 3-item scale for risk management by Raz, Shenhar & Dvir's (2002), and three items of the scale for measuring project planning by Dvir et al. (2003).

The ethical considerations were made to ensure confidentiality and anonymity of the respondents. The respondents were informed about the research purpose and the right to withdraw from participation at any stage.

SmartPLS 2.3.8 software was considered for the structural equation modelling (SEM) technique for data analysis. PLS-SEM data analysis contains two steps, namely, a measurement model and a structural model.

4. Results and Data Analysis

4.1. Measurement Model

Cronbach's alpha (α), composite reliability (CR), Average Variance Extracted (AVE) and Fornell – Larcker Criterion are four criteria for validating the measurement model. According to Hair, Hult, Ringle and Sarstedt (2016), the threshold value for Cronbach's alpha and composite reliability is to be equal or greater than 0.7, whereas the AVE value should be equal or greater than 0.50. The reliability of the data in distinctive economies and the results of the study are presented in Table 1 and Figs. 2 and 3, respectively. Moreover, the Fornell–Larcker Criterion is based on the correlation between exogenous variables while such values of the variables are compared with the square root of AVEs. Lastly, Table 2 reveals correlations between all the variables of interest that are lesser than the square root-averages (AVEs), which are highlighted crosswise following the strategy by Hair et al. (2016).

Cronbach's alpha was used for reliability to measure the internal consistency of Project Planning (PP), Risk Management (RM) and Project Success (PS). In other words, it was used to measure the overall reliability of the survey questionnaire. Results revealed that PP=0.798 > 0.7 in the UK and PP=0.771 > 0.7 in Pakistan (acceptable); RM=0.757 > 0.7 in the UK and RM=0.721 > 0.7 in Pakistan (acceptable); and PS=0.821 > 0.7 in the UK and PS=0.799 > 0.7 in Pakistan (acceptable). Hence, there was internal consistency among the items on the scale (Tab. 2). Likewise, CR values in both countries were greater than 0.7, indicating that composite reliability is acceptable

Tab. 2. Reliability values of constructs

Constructs	United Kingdom			Pakistan		
	A	CR	AVE	α	CR	AVE
PP	0.798	0.769	0.534	0.771	0.752	0.530
RM	0.757	0.724	0.521	0.721	0.719	0.512
PS	0.821	0.805	0.597	0.799	0.732	0.525

Note: PP=Project Planning; RM=Risk Management; PS=Project Success

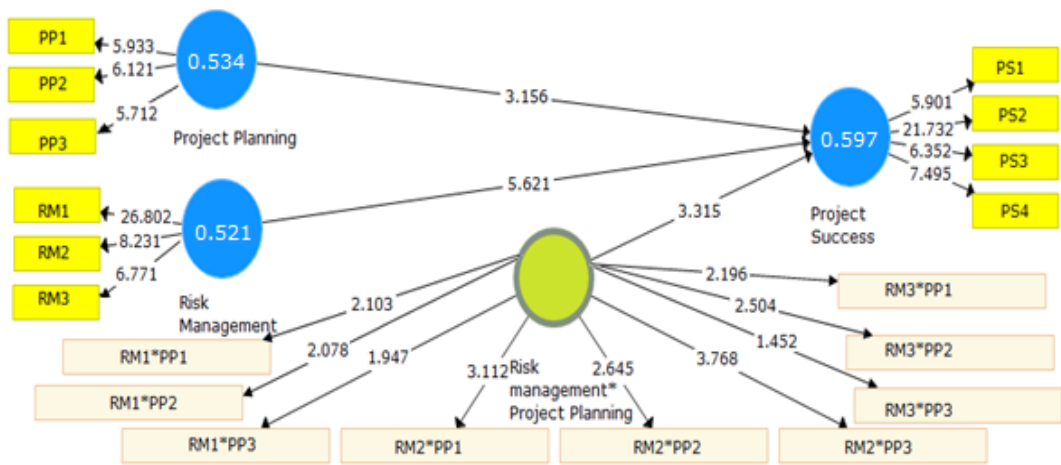

Fig. 2. Moderating effect of risk management on project planning and project success in the UK's construction industry

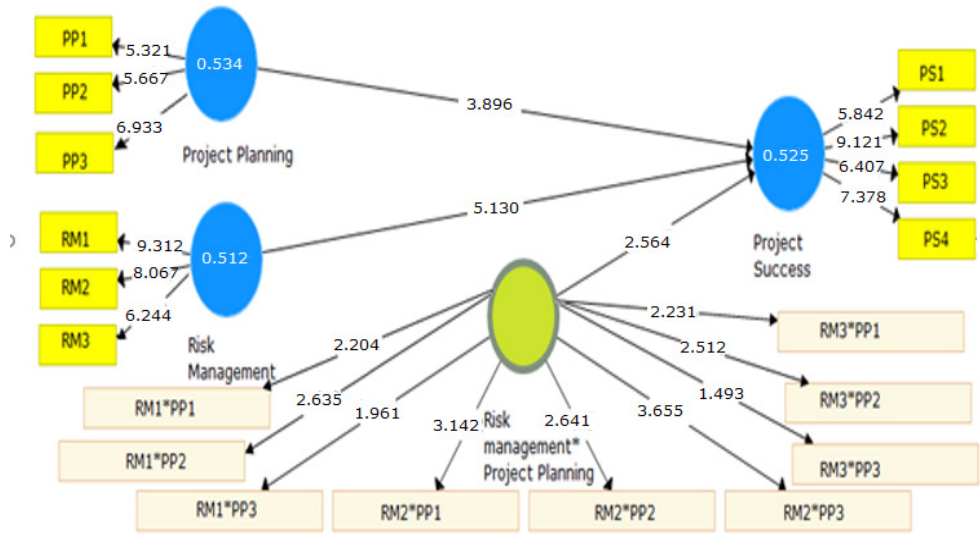

Fig. 3. Moderating effect of risk management on project planning and project success in the Pakistani construction industry

while AVE values in both economies were greater than 0.5. Thus, the measurement model is valid (Figs. 2 and 3). In the case of the Exploratory Factor Analysis (EFA), it was considered to follow the approach by Gaskin and Happell (2014) to measure the validity of the model. KMO and Bartlett test value=0.797 > 0.7 (acceptable), communalities extraction lies between 0.3 to 0.8, indicating the model is a good fit whereas the total variance was 62.3% for three items confirming the validity of the model.

4.2. Structural model

In the next step, the validation of the structural model was assessed based on three criteria for making the decision regarding the considered research hypotheses. This included the model evaluation through path coefficient criteria specifically intended for testing hypotheses, the coefficient of determination (R2) and the effect size (f2). The criteria in the path coefficient were assessed by considering t-value, which should be equal or greater than 1.96 at the 0.05 significance level. According to Imran, Haque & Rębilas (2018), the threshold t-value must be 1.96 while the probability value should be less than 0.05. Additionally, R2 reflects the regression or variability within the dependent variable caused by the consid-ered predictor (Imran et al., 2018).

Tab. 3. Fornell-Larcker Criterion (validity values of constructs)

	United Kingdom		
Constructs	PP	MR	PS
PP	0.781		
RM	0.691	0.724	
PS	0.712	0.661	0.776
	Pakistan		
PP	0.726		
RM	0.747	0.768	
PS	0.703	0.596	0.765

Note: PP=Project Planning; RM=Risk Management; PS=Project Success

According to Hair et al. (2016), R2=0.75 reflects substantial variability while 0.50 indicates moderate variability and 0.25 is weak variability. In the present study, the R2 was acceptable with R2=0.761, indicating the variability of 76.1% in the dependent variable, which was caused by latent variables in the UK and R2=0.672 in Paki-stan, revealing the variability of 67.2% (Tab. 4). Lastly, Cohen et al. (2013) and Imran et al. (2018) explained that the effect size (f2) of up to 0.02 is small, 0.15 is moderate, and 0.35 is strong. The results are presented in Tab. 3 and Figs. 2 and 3.

Tab. 4. Results of the Structural Model

Hypothesis	*B*	SD	T Value	Decision	*f2*	*R2*
United Kingdom						
PP -> PS	.184	0.060	3.156	0.004**	0.160	0.761
RM -> PS	.204	0.037	5.621	0.000**	0.251	
RM*PP -> PS	.189	0.057	3.315	0.002**	0.371	
Pakistan						
PP -> PS	.198	0.051	3.896	0.041**	0.018	0.672
RM -> PS	.431	0.084	5.130	0.000**	0.211	
RM*PP -> PS	.277	0.108	2.564	0.024**	0.351	

Note: ***p<0.1, **p<0.05, ns= nonsignificant (p>.05) (Two Tail)

5. Findings and discussion

Findings of the present study confirmed that there is positive linkage between project planning and project success as the t-value was greater than 1.96 (UK=3.156 > 1.96; Fig. 2; PAK=3.896 > 1.96, Fig. 3, Tab. 4) while the p-value was less than alpha (UK=0.004 < 0.05; PAK=0.041 < 0.05, Table 4). Thus, due to statistically significant evidence, we fail to reject the hypothesis H1. As a result, this study supports the earlier work by Murphy et al. (1974), Naeem et al. (2018), and Sanvido et al. (1992). Hence, it confirms that better planning has a positive impact on the success of a project and enables project managers to adequately complete their projects. Results demonstrate that project success is positively affected by project planning and effective planning improves the performance of a construction business. The findings also confirm that appropriate planning for managing risks has been perceived to improve the possibilities of project success (Raz & Micheal, 2001). Nevertheless, the finding is significant in confirming the positive linkage between project planning and project success in the construction industry of contrasting economies.

Additionally, the findings confirmed that risk management had a positive significant association with the project success (UK=5.621 > 1.96; Fig. 2; PAK=5.130 > 1.96, Fig. 3, Tab. 4) while the p-value was less than alpha (UK=0.000 < 0.05; PAK=0.000 < 0.05, Tab. 4). Hence, in the light of the statistical evidence, we fail to reject the hypothesis H2. Therefore, there is a positive linkage between risk management and project success. The findings support the previous studies, including Lundin (1995); Naeem et al. (2018); Turner (2006); and Zhang (2007). The reason behind this is evident: new innovative ideas help in managing risk to achieve research objectives, which leads to the success of a project. Risk management reduces the chances of adverse effects on the timely completion of a project. Nevertheless, risk management is likely to depend on the individual ability of the project manager. This conclusion confirms the work by Zhang (2007), stating that the project manager's ability, flexibility, robustness and adaptability are vital in the project success, which is the reason why proper planning is essential.

Another key objective of the paper was to investigate the moderating effect of risk management on project planning and project success. When the p-value was less than alpha (UK=0.002 < 0.05; PAK=0.024 < 0.05, Tab. 4), the statistical results (UK=3.315 > 1.96; Fig. 2; PAK=2.564 > 1.96, Fig. 3, Table 4) confirmed the hypothesis H3 could not be rejected because of statistically significant evidence that supported it. Hence, in the light of the evidence, this study supported the existing literature, especially works by Brannen & Salk (2000); Dalcher (2012); and Pinto & Slevin (1989). Previously, the work by Raz and Michael's (2001) established that planning risk management was an essential attribute of the successful implementation of project planning, that eventually led to the success of a project (Raz & Michael, 2001).

Furthermore, the size effect (f2) of project planning, risk management and project success are substantial in both Pakistan and the UK. Additionally, the variability of project success is explained to a greater extent by the variation within the project planning and risk management in construction businesses of both countries. In other words, adequate procedure considered for the management of project

risks and rational planning largely determine the success of a project.

Conclusion and recommendations

In the light of the evidence, this study confirmed the moderating effect of risk management, which was highly statistically significant for project planning and project success of construction businesses operating in the economies of Pakistan and the United Kingdom. The study revealed that despite the difference in types of economies, challenges, variations and business trends were largely similar in the construction businesses of the UK and Pakistan. Therefore, the project planning and project success were largely positively moderated by risk management and the effect was similar in both economies. The size effect (f2) of the mediator was strong in terms of project planning and project success. Additionally, the study confirmed that project planning and risk management positively affected project success in different economies. Nevertheless, despite differences in structural policies, rules and regulations and management styles, adequate project planning and risk management practices were largely similar in the UK and Pakistan. The conceptual framework of the present study validates the model, according to which project risk management is a significant mediator of project planning and project success in the construction industry of distinctive economies.

The recommendations are derived from the findings of this study. It is suggested that the construction firms operating in Pakistan and the UK should consider appropriate strategic steps regarding financial, technical and human risks during the stages of planning and implementation to ensure the success of a project. In addition, the governments of both economies should consider the introduction of flexible tariffs and subsidies for construction businesses to provide them with sufficient contingency funds to deal with the uncertain environment. Moreover, the construction businesses should also consider the use of the simulation technique for training project managers so that they have sufficient skills to assess different types of risks and use this information to further improve project planning and execution, which would ensure the project success. It is also recommended that governments should work in close collaboration with construction businesses, especially offering the environmental scanning, to address the uncertainty and risks so that more peripheral decision-making would emerge from using the latest and advanced tools and techniques for planning purposes.

In the future, researchers should consider the use of the present model in other sectors, including services and manufacturing businesses, so that the research framework could achieve higher generalization. The longitudinal panel study could be used to further explore the variations within different time intervals. In-depth interviews with project managers should be held to gain a deeper understanding about the moderating effect of risk management on project planning and project success to examine the better understand the impact on the work, worker and workplace. Ideally, the sample size is acceptable; however, it could be further improved to gain greater generalization. These considerations would further improve generalizability in future studies.

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An analysis into early customer experiences of self-service checkouts: Lessons for improved usability

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ABSTRACT
The research aims to examine the perceptions of relative novice users of self-service checkouts (SSCOs) and if these perceptions change before, during and following use. Employing a diary approach with 31 respondents relatively unfamiliar with SSCOs, the research will document their experiences with this technology across stationary, hardware and grocery stores in two Scottish cities (Glasgow and Dundee). Findings suggest that the majority of respondents were motivated to use the technology because of time saving and convenience. However, the actual experience of using SSCOs was not always considered quicker when compared to staffed checkouts because of technical issues, lack of staff assistance and the impersonal, sometimes stressful and controlled nature of the cramped SSCO environment. Following post-use reflections, the majority of respondents' opinions did not change from their initial perceptions and indicated that they would prefer not to use the technology in the future. Based on the findings, this study makes some practical suggestions centring on the design and usability of SSCOs, which may go some way to reducing customer dissatisfaction and frustration with the technology, especially from the perspective of new users of the technology.

KEY WORDS
self-service checkouts, retail, control, customer experience

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Introduction

The use of self-service technologies (SSTs) has been increasingly incorporated into the retail environment (Arnfield, 2014; Yang, Liu & Ding, 2012; Jamal, 2004; Burke, 2002; Merrilees & Miller, 2001) in recent years, with "many leading European retailers… heavily investing in self-scanning technology as part of their growth strategy" (Retail Technology, 2010, p. 1). SSTs are defined as technological interfaces, which assist the customer in the service process without the direct engagement of staff (Oyedele & Simpson, 2007; Meuter et al., 2000) and are considered mutually beneficial to the customer and the retailer. Concerning customers, SSTs provide convenience, autonomy, and may save time spent queuing (Collier & Kimes, 2013; Turner & Borch,

2012; Lee et al., 2010; Dabholkar, Bobbitt & Lee, 2003; Meuter et al., 2000). For retailers, the technologies contribute to reducing labour costs and improving productivity (Kleemann, Voß & Rieder, 2008; Anitsal & Schumann, 2007). The use of these technologies changes the nature of the consumer-staff relationship to a consumer-technology relationship (Hilton et al., 2013), which, although creating a more autonomous experience, encourages a working consumer as a consequence (Anitsal & Schumann, 2007; Voss & Rieder, 2005).

It is within the context of an increased use of SSTs in general, and the SSCOs in particular, that this research will investigate its debated use and usefulness to consumers and retailers alike through an examination of consumer perceptions and experiences across multi-channel retailers. We focus specifically on the novice user and their perceptions prior, during and following interactions with self-service technology; focusing on these users allows us to derive insights into the perceptions of the technology without these perspectives being influenced by past usage experience, both positive and negative. Given that SSTs have found acceptance with customers in the UK, following more than 15 years of increased implementation in retail, it will be informative to assess to which extent relatively novice users perceive its use, especially in terms of its perceived usability for new markets. The user group consisted of German individuals, who used an SST while being on an academic scholarship visit to the UK. According to the German EHI Retail Institute (2017), the number of self-service tills in German retail in 2017 was 3,200, which is low compared to the British retail figure, which was already over 15,000 by the end of 2011 (Retail Banking Research, 2011). Given that SSTs are not as prevalent in German retail channels as it is in the UK, the perceptions of this user group provided a unique opportunity to gauge user perceptions on already implemented (and user accepted) technology. Addressing an identified gap in the literature around the perspectives of novice users towards SSCOs, this research will inform solutions to consider in the design and usability of the technology for users to appeal to future markets of SSTs. The structure of the paper follows an established format, with an evaluation of the literature following this introductory section, where the evaluation will focus on customer interaction with SSCOs, perceived control and emotion. The methodology is then discussed, focusing on the justification for the approach, followed by results and discussion. The research concludes with a brief overview, underlining the significance of the study and makes recommendations for further research.

1. Literature review

In recent years, a wide range of studies has investigated various aspects of the use of SSTs (Tab. 1). These research themes include the motivations for their use, the potential barriers to the successful integration of SSTs into a retail setting and the issue of theft and how SSCOs could encourage criminal activity. Research has also been conducted on the impact of a user's skill and experience levels, customers' preference for contact with personnel in relation to SSTs and the need for human–human interaction. The increased integration of SSTs into the retail environment has arguably created a distance between the customer and retailer (Wynne, 2016),

Tab. 1. Themes emerging from the literature on self-service technologies (SSTs)

Research theme	Academic research
The motivation for the use of SSTs	Anon, 2016; Anon, 2014; Lee et al., 2010; Dabholkar, Bobbitt & Lee, 2003; Meuter et al., 2000
Potential barriers to the integration of SSTs including theft	Åkesson, Edvardsson & Tronvoll, 2014; Knapton, 2016; Wynne, 2016
User skills and experience levels	Jayasimha & Nargundkar, 2006
Consumer preference for human interaction	Wang, Harris & Patterson, 2013; Reinders, Dabholkar & Frambach, 2008; Collier & Kimes, 2013; Simon & Usunier, 2007
Control of the consumer	Lee & Lyu, 2016; Reinders, Dabholkar & Frambach, 2008; Oyedele & Simpson, 2007; Nysveen, Pederson & Thorbjornsen, 2005; Hoffman, Novak & Schlosser, 2003; Venkatesh, 2000

and raised issues in the literature around consumer control. The research, however, in each of these areas is not exhaustive, with only a few studies specifically examining customer interactions with an SST and SSCOs (Steenkamp & Maydeu-Olivares, 2015; Lee et al., 2010; Dean, 2008; Dabholkar, Bobbitt & Lee, 2003; Meuter et al., 2000), which suggests further work could be done in this area.

The Technology Acceptance Model (TAM) (Davis, 1989) is one of the most widely recognised frameworks to model user intentions towards the use of technology. It has informed the more recent model of Unified Theory of Acceptance and Use of Technology (UTAUT) (for a comprehensive overview see Venkatesh, Thong & Xu, 2016). TAM's core components (Davis, 1989) suggest that perceived usefulness and perceived ease of use directly impact on the intention to use a technology (Davis & Wiedenbeck, 2001), which in turn determines usage behaviour of this technology; furthermore, social and cognitive instrumental processes also mediate user acceptance (Venkatesh & Davis, 2000). Interestingly, increased experience with a system induced individuals to continue to judge a system's usefulness based on potential status benefits resulting from its use, and to rely less on social information in forming perceived usefulness and intention, pointing to a differentiated effect of social influence depending on system usage. Ease of use is also of importance for developing trust relationships with technology, and more so than general and organisational trust of users (Ejdys, 2018; Ejdys & Halicka, 2018).

1.1. Consumer satisfaction with SSCOs

The use of an SSCO is not confined to one retail sector, although they have proved popular among those retailers where saving time and convenience are important factors to the customer experience. Typically, consumers using self-service benefit from less queuing time, and can expedite their transaction in a quick, convenient and autonomous manner (Jones, 2016; Jammi, 2014; Collier & Kimes, 2013; Lee et al., 2010; Muller, 2008).

However, are customers satisfied with their experience of SSCOs? According to Engel et al., (1995, p. 481) customer satisfaction is associated with "the outcomes of the subjective evaluation that the chosen alternative (the store) meets or exceeds expectations." If a customer is satisfied with the 'usability' experience and/or has the perception that their expectation has been exceeded, then the customer's willingness to increase the frequency of their visits to the store and as a result their purchases (McNamara & Kirakowski, 2008; Venetis & Ghauri, 2000; De Ruyter & Bloemer, 1999) should also increase. The reverse is also true: dissatisfied customers are likely to decrease the frequency of visits and spending in the store. The question of the role SSCOs play in a consumer's satisfaction and repeat patronage of a store (Hogarth et al., 2004; Bloemer and De Ruyter, 1998; Mittal and Lassar, 1998) is not, however, easily answered, as there are several variables associated with consumer satisfaction (Tab. 2). These variables include, and are by no means an exhaustive list, the product range, consumer service, the specific role of the employee, price and promotion, store atmospherics and location.

Customer judgement of satisfaction is argued to centre on the quality of their experience with the product and/or service (Beerli et al., 2004; Andreassen & Lindestad, 1998; Liu, Yang & Liu, 2017; Oliver, 1997; Oliver, 1993) and the perceived value they receive (Andreassen & Lindestad, 1998). The gap

Tab. 2. Themes emerging from the literature on customer satisfaction

Research theme	Academic research
Product range	Yavas & Babakus, 2009; Miranda, Konya & Havrila, 2005
Customer service	Butcher et al., 2001; Heskett et al., 1997; Javalgi & Moberg, 1997
The role of the employee	Collier & Kimes, 2013; Lee et al., 2010; Wong, 2004; Swan, Bowers & Richardson, 1999
Price and promotion	Miranda, Konya & Havrila, 2005; Uusitalo, 2001; Urbany, Dickson & Sawyer, 2000
Store atmospherics and location	Yavas & Babakus, 2009; Miranda, Konya & Havrila, 2005

between what was expected, what was delivered, and the interplay between the expected, experienced and perceived function (Andreassen & Lindestad, 1998; Grossman, 1998; Anderson et al., 1994) can be argued to be an important determinant when examining customer engagement with SSCOs.

1.2. Consumer dissatisfaction with SSCOs

Vouk, Guszak and Sisek (2011), Meuter et al., (2000) found that customers were generally dissatisfied with the technology, specifically the handling of price discrepancies, the purchasing of alcohol, barcodes which were not easily scanned and a customer's ability to collect 'change' or returned money (Dillon, 2010). These factors, which influence levels of satisfaction and dissatisfaction taken in the context of whether users of SSCOs see themselves as co-creators (Hilton et al., 2013; Ballantyne, Williams & Aitken, 2011) or working customers (Anitsal & Schumann, 2007; Voss & Rieder, 2005), impact on customer perceptions and the emotional investment with the interaction. It is this issue of dissatisfaction and its relationship with the user's emotional state, in particular the issues of control (Lee & Lyu, 2016; Oyedele & Simpson, 2007; Nysveen, Pederson & Thorbjornsen, 2005; Wong, 2004) and frustration (Bessière et al., 2006; Lazar et al., 2006), which will be investigated further in this research.

1.3. Perceived control

A consumer's use of an SSCO can also be argued to be founded on the need to be in control (Lee & Lyu, 2016; Oyedele & Simpson, 2007; Hoffman, Novak & Schlosser, 2003), which "enhances consumer evaluations of this process and also directly impacts intentions to use the option" (Dabholkar, 1996, p. 36). However, when these feelings of control are disrupted by, say, staff intervention (Hilton et al., 2013; Dabholkar & Bagozzi, 2002), consumer frustration may emerge. The emotional state of frustration occurs when an individual has their route to goal achievement blocked (Bessière et al., 2006). Relating control and emotion to an individual's use of SSCOs, the goal achievement would be a quick, convenient and autonomous transaction (Lee et al., 2010; Dabholkar, Bobbitt & Lee, 2003; Fitzsimmons, 2003; Meuter et al., 2000). The blocks to this achievement would be internal (e.g., lack of knowledge and/or ability) and/or external (e.g., the physical environment and/or other individuals, for example, staff required to assist in the transaction process) (Bessière et al., 2006). If a consumer feels frustrated, requiring assistance and/or approval to continue the process (Jones, 2015) rather than being in control of the process, future customer intentions may be to avoid using the technology altogether (Bessière et al., 2006; Lazar et al., 2006). It has been shown that self-efficacy (Bessière et al., 2006), i.e., the belief in one's own capability to achieve a goal or outcome (Locke & Latham, 1990), influences levels of frustration and, in turn, the commitment to the interaction (Bandura, 1986). In the case of SSCOs, if a customer is unable to achieve his/her goal with the used technology, customers may become more frustrated and dissatisfied with SSCOs and be less committed to using the technology (and perhaps the retailers who have them), consistent with a lack of perceived usefulness and ease of use of the technology (TAM).

2. Methodology

2.1. Current Study

The current study addressed two research questions: 1) what are the perceptions of relative novice users of SSCOs and 2) do these perceptions change before, during and following the use? Both questions were explored prior to a larger empirical study comparing familiar and unfamiliar users of SSCOs (not reported here). Because of their lack of familiarity with SSTs in general and SSCOs in particular, it was anticipated that the research group used in this study, i.e., unfamiliar with the use of SSCOs, would be able to provide a detailed account of their customer journey through unbiased eyes, a perspective that would be less likely from an experienced user due to their prior knowledge and pre-conceptions. Given that SSTs have been around for several years in the UK, with the refinement of the technology and, thus, improvement of usability aspects, it was a unique opportunity to assess how users relatively unfamiliar with the technology were interacting with it. It is acknowledged that this approach could be considered to have the limitation related to the focus on a specific cohort of consumers, thus affecting generalisability. However, the research intended to examine this particular cohort of consumers given their ability to provide a unique perspective, so it was not deemed a limitation. In addition, while the sample size was arguably small, the richness of data generated from this diary

approach painted a comprehensive picture of the consumer experience. From a practical point of view, the findings would be of relevance for companies exploring the use of SST in future markets. The theoretical contribution of the work surrounds the exploration of whether perceptions of SSTs change with their usage. Depending on the nature of the respondent's experience, the findings reveal the extent to which user perceptions compare with the other findings that suggest usefulness perceptions may be affected by experience with a technological system (Venkatesh & Davis, 2000). Addressing these questions will consolidate the existing literature and take research forward in the area of user perceptions and usage of SSTs.

This research used a qualitative diary method approach with 31 German respondents (23 females and eight males, aged between 20 and 42, with a median age of 20.5) who had limited experience with SSCOs and were visiting Scotland as part of their academic studies.

The majority of respondents reported having had very occasionally or never used SSCOs in their home country; those few who had used SSTs did so in electronic stores, grocery stores, petrol stations and furniture/hardware stores. A lack of engagement with SSCOs did not, however, mean that respondents did not understand what SSCOs were; all respondents were able to define the technology using key phrases such as "scanning and purchasing products by yourself" and "without the support of staff." A typical response was "self-scan checkouts (SSCOs) means that the whole purchasing process will be done without the help of a staff member." Respondents' understanding of the concept provided evidence that SSCOs were not an alien concept to the cohort and that they knew of their existence and function although they were less or not familiar with the use of the technology. The responses also underlined the understandable nature of the diary questions, which were also piloted to ensure clarity of their phrasing.

The respondents were asked to document their experiences with SSCOs across multichannel retailers, which included a stationery retailer, a grocery retailer and a hardware retailer operating in Glasgow and Dundee. The diary approach allowed the capture of customer perceptions and experiences of SSCOs prior to the use, during the use and following the use in real time (Laurenceau & Bolger, 2005), "in their natural, spontaneous context" (Bolger, Davis & Rafaeli, 2003, p. 580), thus reducing the limitations of retrospection (Bolger, Davis & Rafaeli, 2003). An often-cited limitation of this approach was the burden put on the participant, however, in line with good practice (Bolger, Davis & Rafaeli, 2003); the diary was designed to be short and took only several minutes to complete at each stage of the customer journey using SSCOs at various retail locations. The responses were analysed using content analysis so that the research could gain a broad description of the respondent experiences and, subsequently, some understanding of identified phenomena (Elo & Kyngäs, 2008; Pirzada, 2016). This approach allowed for the interpreting of meaning and relationships (Denzin & Lincoln, 2011) within and between the stages of SSCO engagement. Coding was vital in assigning meaning to the statements, with open coding used to unlock the data and their importance for existing theory (Strauss & Corbin, 2008).

3. Results and Discussion

To address the aims of this research, the qualitative responses were grouped around three main themes: respondent perceptions of SSCOs prior to the use; respondent experiences during the use; and, after having used the technology, respondent post-use reflections including perceptions of the future use and suggestions on how to improve the design, usability and experience of SSCOs. Throughout the analysis, representative quotes from respondents were used to illustrate themes that emerged from the diary reporting.

3.1. Customer perceptions prior to using SSCOs (in-store experience)

The majority of respondents thought the usage of SSCOs in general, but particularly for grocery retail, would have a negative effect on the in-store experience of customers, specifically the organisation's ability to build relationships with customers, leaving them, in some cases, feeling isolated (Tab. 3). A minority of respondents added that this feeling could be particularly acute among older customers, which they expected to feel confused and isolated if they used SSCOs due to the potential effects of the digital divide, an emotional theme that is consistently revealed in this research and will be revisited later in the discussion.

A minority (four) of respondents thought that SSCOs could have a positive impact on the shopping experience of families, allowing children to be more

Tab. 3. Respondent perceptions prior to using SSCOs (in-store experience)

Theme	Representative quote
Negative impact — the lack of relationship-building leading to isolated users	"the company isn't able to interact with the people, there's no possibility to build up any social contacts or personal loyalty to the customer" "there is nearly no human/personal aspect in the customer experience with the organisation, this might lead to negative experiences for the customer if he feels alone in the customer journey"
Positive impact — allow child engagement in the shopping process	"for children it's an attraction, to be more involved in shopping"
Positive impact — financial savings for the organisation	"the benefits are for the organisation, it creates unemployment replacing workers, mostly mothers working part-time, with machines"
Positive impact — trusting the user	"[it] makes the customer feel like they are processing shopping quicker, have extra abilities and trust given towards them"

involved in the shopping process. In their opinion, the use of the technology was easier if more than one person was involved and that the technology appealed to younger people. This observation was supported by Dean (2008). An interesting addition to comments relating to the involvement of children was that SSCOs could have a particularly beneficial impact on parents with smaller children, as it was noted by some respondents that SSCOs "have no sweeties" next to the check-out area.

A minority (four) of respondents referred to the financial savings for the organisations as a benefit of SSCOs. This particular finding is consistent with the notion that SSCOs create the working customer (Anitsal & Schumann, 2007; Voss & Rieder, 2005), replacing the customer–employee relationship with a customer–technology one (Hilton et al., 2013) which reduces organisational labour costs (Kleemann, Voß, & Rieder, 2008; Anitsal & Schumann, 2007).

One respondent stated that SSCOs gave customers the impression that the organisation trusted them to complete the purchasing transaction themselves, providing them with a choice to use staffed or non-staffed checkouts and overall quicker experience in a more modern retail environment. This was a particularly interesting observation, and the respondent thought that rather than creating a working customer (Anitsal & Schumann, 2007; Voss & Rieder, 2005), the organisations were, in fact, empowering customers, trusting them to complete their transaction without the need for staff. However, as we will observe later in the research, respondents noted that staff were very much required to complete many of the transactions.

Another respondent argued that SSCOs would not play either a positive or negative role in the customer experience of an organisation, with customers simply accepting the technology as part of the retail experience. This respondent argued that SSCOs simply provided an alternative to customers for when it was needed, for example, when a customer had a limited amount of time in which to shop, when the customer was presented with long queues at staffed checkouts and/or when the customer had a small number of products to purchase, findings which are supported by the literature (Turner & Borch, 2012; Lee et al., 2010; Dabholkar, Bobbitt & Lee, 2003; Meuter et al., 2000).

3.2. Customer perceptions prior to using SSCOs (motivation)

The respondents were asked to document their motivations for using SSCOs based on their in-store observations but before engaging with the technology. The analysis of the respondents' diaries revealed two predominant themes, namely, 1) time saving because of shorter queues and 2) convenience when the customer had a small number of low involvement items. These themes are consistent with the findings by other researchers (Turner & Borch, 2012; Lee et al., 2010; Dabholkar, Bobbitt & Lee, 2003; Fitzsimmons, 2003) and, as observed earlier, they provide some insight into why customers would use the technology as an alternative to staffed checkouts to be used when customers deemed it appropriate.

Respondents were asked to document situations in which they would and would not feel like using SSCOs. It should be re-emphasised that respondents had been familiar with the concept of self-service but had not used the technology regularly. The comments clearly indicated that respondents could imagine scenarios for usage of SSCO, which were based on potential exposure to it.

The majority of respondents indicated that certain criteria were necessary for using or not using the technology (Tab. 4). The criteria included a low

Tab. 4. Circumstances under which respondents feel they would use or not use SSCOs

Theme	Representative quote
Having a low number of products	"I wouldn't buy a lot of products or high involvement products at self-service because I want to get some advice for the product and want to get everything checked"
Small-sized products, light in weight	"it's just easier and quicker to pack a few products which are light and easy to handle"
Low complexity products	"I prefer to use staffed checkouts if I have fruit or something, products without barcodes because I don't know how to handle them"
Long queues at staffed checkouts	"I wouldn't use self-service if there is a staffed check out without a very big queue"
Convenience products purchased every day	"convenience products, low involvement, which I've had experience with"
Sufficient space surrounding the checkout area	"there isn't space at self-service checkouts [SSCOs], you are close to other customers and if the barcodes don't scan or you don't know where the barcodes are you are taking a lot of time"
The emotional state of the consumer	"I would use self-service if I'm sad and I don't want to speak to anyone" "If I felt lazy or tired I would use self-scan"

number of products; products small in size and light in weight; complex products, i.e. where the barcodes were not clearly displayed; long queues at staffed checkouts; convenience products which were familiar and of low involvement (i.e. products which did not require much thought, those purchased almost every day); limited space around the checkout area and, interestingly, the emotional state of the purchaser.

The reasons respondents provided for use and non-use of SSCOs centred on the nature of the product(s) and appeared reasonable from an operational point of view. It makes sense that having a large number of items would encourage respondents to use a staffed checkout given the anticipated level of assistance required and space available. It is also conceivable that respondents would not choose to use an SSCO for products which were not convenience products, or require high "involvement", as they might require a staff member to assist or perhaps remove the security tag from some products, an issue identified in the literature (Vouk, Guszak & Sisek, 2011; Dillon, 2010; Meuter et al., 2000). It was interesting, however, that respondents cited complexity of a product as a reason for not using SSCOs; by complex the respondents meant products without a visible barcode. The last two themes could perhaps have been grouped into one theme, relating to specific product features; however, they were kept separate as the aspect of familiarity distinguished between the two, with complex products still being familiar products, i.e. purchased regularly.

Another interesting observation was the fact that some respondents would not use SSCOs for large and difficult to handle products; arguably, the same level of effort is required to lift a bulky item onto the conveyor belt of a staffed checkout, as it is to put it through a SSCO. Therefore, the interpretation from the respondents' diaries is that the respondents thought larger, bulkier items were perhaps more difficult to scan, i.e. finding the barcode and positioning the product to enable it to be scanned. The interpretation is also supported by the literature, with the scanning of barcodes identified as a potential barrier and a cause of consumer dissatisfaction and frustration (Vouk, Guszak & Sisek, 2011; Dillon 2010; Meuter et al., 2000). Not being able to find barcodes could lead to a customer waiting for assistance at SSCOs, which would make some respondents feel "controlled", an emotional state, which, in their words, turned to stress, but not aggression, which was identified in the literature (Knapton, 2016).

We can further observe from the diaries that many respondents thought that SSCOs were impersonal, encouraging antisocial behaviour due to the limited interaction with people. Respondents thought the area created an environment where people of mixed experience and skills with the technology stood close to each other leading to a state of irritation and stress, heightened by situations where the transaction was not smooth. As one respondent put it, "it makes shopping very unpersonal [sic] and unsocial because you could do your purchases without talking, watching or interacting with somebody" and "the space is limited, you feel rushed, there is usually a queue, and people push past you making you stressed".

Many respondents thought the SSCO environment encouraged 'crowding' (Dabholkar & Bagozzi, 2002), and had the drawback of creating negative emotions due to space stress, compounded

by failures in the process and the lack of staff relationships. It seems reasonable to suggest that staff training, i.e. when to be present but not a threat or stressor at SSCOs, seems to be a critical issue. Consumers appear to value the social interaction with others as part of the service encounter, which is consistent with the literature (Jammi, 2014; Simon & Usunier, 2007) and informs the discussion of perspectives towards SSCOs prior to their use.

3.3. Respondent perceptions of SSCOs during their use

Following the logging of respondent perceptions, motivations and evaluation of the role of SSCOs on the retail experience, they were prompted to document their actual use of the technology. Respondents were asked to document their transactional journey with SSCOs, outlining the process from start to finish which included, although not exclusively, the following stages: approaching the SSCO, scanning products, placing products into bags, making a payment, receiving the receipt and change/ money back and exiting the SSCO area. Throughout this process, respondents were asked to identify issues with the current process and how these were resolved.

Unsurprisingly, the majority of respondents followed on-screen instructions at the SSCO and found the process relatively easy to follow. A typical walk-through from respondents was the following: placed the products on the left- or right-hand side of the SSCO, scanned products, placed products in bags provided on the right- or left- hand side of the checkout, chose the method of payment, made the payment, collected the receipt, change and bags and exited the checkout area. One respondent placed the products on the wrong side (the bagging side) of the SSCO and could not understand why they were unable to proceed with their transaction. However, following some prompting from a friend accompanying the respondent, they placed the products on the correct side of the checkout. This particular respondent also documented that they had difficulties scanning fruit, which required further assistance from the same friend; they stated, "fruit had no barcodes, so I don't know how to handle them". In both cases, the respondent acknowledged that they had not followed the on-screen instructions.

In terms of respondent experiences with SSCOs, identifying any problems around the design and usability, which affected their dissatisfaction and frustration, the research revealed that all but one of the respondents encountered problems, which were either technical or process-related (Tab. 5). The majority identified technical problems, followed by process problems, predominantly around the purchasing of alcohol or by simply being unable to proceed with the scanning of products. Typically, in these instances, respondents received a message indicating the need for a member of staff to intervene and enter a code to allow the respondent to proceed with their transaction. The specific scanning problems identified by respondents were: scanning products with no barcode; scanning products on special offer or reduced price; having some products that were expected to have a barcode but did not have one and vice versa. These issues were compounded by the necessity to have a staff member's assistance and the time taken for issues to be resolved typically because "there was (usually) only one member of staff and she was solving other issues."

A minority of respondents identified problems with the process of the SSCO transaction, centring around three key issues. The first issue surrounded the placing of products prior to and following scanning on either side of the scanner. Those respondents argued that placing the products, particularly in the bagging area of the checkout frequently led to a verbal message "unexpected item in the bagging area" which required a staff member's assistance to allow the process to continue. The second issue — the lack of space on either side of the SSCO and between checkouts — raised by respondents was directly related to the first and raised throughout this research. Respondents felt that there was a limited amount of space to place the basket, which also interfered with individuals at the adjacent checkout who were putting products into bags in the bagging area. The third and final issue raised by respondents was related to the payment stage of the transaction process. Some respondents indicated that making payments with Scottish banknotes posed a problem, with the SSCOs repeatedly refusing to accept the note.

These observations made by participants are consistent with those made by other researchers, namely, the possibility that SSCOs could actually prolong the transaction instead of enabling a fast and convenient service, which SSCOs are supposed to deliver (Turner & Borch, 2012; Dabholkar, Bobbitt & Lee, 2003; Dabholkar & Bagozzi, 2002; Meuter et al., 2000). Issues surrounding barcodes and age-restricted purchases, such as alcohol, which require the intervention of a staff member, impact negatively

Tab. 5. Themes that emerged from the use of SSCOs

Theme	Representative quote
Technical problems (Barcodes)	"I struggled with a baguette from the bakery section. I thought I had to manually put the item in but it, in fact, had a barcode printed on it which I found confusing as which bakery items should be scanned and which should be put in manually"
Technical problems (staff member intervention)	"It was frustrating to realise that if you buy alcohol at the self-scan you have to wait for a staff member. He has to check your ID to check how old you are. After the check of the staff member you can go on" and "the scanner didn't realise that the scanned items were placed on the desk, so the interaction always stopped, and a staff member was needed"
Processual problems (placement of products)	"I usually kept all my items in my hands [not placing them in the bagging area] and was wondering why I couldn't continue" and "when I was scanning my products I laid my umbrella down in the bagging area and wasn't able to continue until a member of staff came and typed in a code"
Processual problems (lack of space at the checkout)	"I wanted to scan many products but there is too little space for all the products, so I decided to go to the staffed checkout"
Processual problems (payment)	"the machine wouldn't accept the Scottish notes; I kept trying until someone came to help"

upon the nature of the transaction (Anon, 2014; Oyedele & Simpson, 2007; Dabholkar, Bobbitt & Lee, 2003; Fitzsimmons, 2003; Dabholkar & Bagozzi, 2002; Meuter et al., 2000). The role of the staff is an important theme. Firstly, it is important to note the assistance they provide in case of a problem, i.e. entering a code to allow the user to proceed with the transaction, which ultimately gives the control over the transaction to the member of staff rather than the consumer. Secondly, the limited number of staff members at the bank of SSCOs delays the response time to transactional problems. These identified issues have the potential to give rise to negative feelings and emotions, such frustration, stress, the sense of isolation and/or being controlled (Anon, 2016; Oyedele & Simpson, 2007; Bessière et al., 2006, Lazar et al., 2006; Nysveen, Pederson & Thorbjornsen, 2005; Hoffman, Novak & Schlosser, 2003; Venkatesh, 2000) and could impact on user perceptions and the future use of SSCOs.

The findings point to the use of several measures commensurate to the identified issues. These could include, among others, staff training to ensure positive interactions with customers, more staff to assist customers, a more generous layout of SSCOs and surrounding spaces to avoid problems arising from placing products in the wrong area in and around the SSCOs. These suggestions, however, may not be consistent with store policies, where resources may be limited and, therefore, an appropriate balance between necessary, desirable and feasible changes has to be found. Such suggestions are discussed later in the research and considered as part of further research.

3.4. Resolving identified issues

When the research investigated how respondents resolved the identified technical and processual issues, opinions were evenly divided between the respondents resolving the issue themselves and having a staff member resolve the issue on their behalf (Tab. 6). Those respondents who dealt with the issue themselves did so by either waiting or persevering until the problem was resolved. The situations where those respondents resolved the issue themselves involved making the payment and/or attempting to process barcodes; a typical response was "I kept trying as there was a lack of assistance and, eventually, I got there." With regard to those respondents who waited for a member staff to assist, they also had issues making the payment and/or attempting to process barcodes. The majority of respondents who had a staff member provide assistance in the transaction would have preferred to resolve the issue themselves and remained in control, an issue consistent with that found by others (Oyedele & Simpson, 2007; Nysveen, Pederson & Thorbjornsen, 2005; Hoffman, Novak & Schlosser, 2003) and which also links to a theme emerging from this research regarding respondents feeling controlled either positively or negatively by the technology. However, those respondents felt they had no choice but to receive staff assistance, as they were unable to continue without the intervention from a member of staff (indicated by a red light above the SSCO). The extent, to which these negative experiences influenced overall respondent reflections of their use, and the

Tab. 6. Themes that emerged during the use of SSCOs (resolving problems)

Theme	Representative quote
Resolved by the user (waited)	"for the problem to resolve itself"
Resolved by the user (persevered)	"I just kept trying until it eventually worked"
Resolved by a member of staff (no choice)	"without them [the staff member] it is difficult to complete the process" and "I scanned an item and couldn't continue. A staff member erased the item but didn't tell me what went wrong. I felt like it could happen again at any time"

Tab. 7. Themes in relation to a customers' emotional state following the use of SSCOs

Theme	Representative quote
Stressed	"using self-service makes me feel stressed. It's complicated and it's very annoying to wait for services"
Nervous	"I felt stressed and nervous before using self-scan and a little bit lost and stressed when I used it"
Frustrated	"I felt frustrated as the process was slow, frustrating and probably slower than queuing at a staffed checkout"
Controlled	"I felt controlled relying on staff and having staff always around"

future use of SSCOs will be described in subsequent sections.

3.5. Respondent perceptions of SSCOs following the use

Respondents were asked to document how their experience using SSCOs made them feel, addressing the emotional dimension of the customer–technology experience (Hilton et al. 2013). This provided further insight into experienced frustration, control and, in some cases, stress as well as the positive and negative emotional motivators behind the use of SSCOs (Tab. 7). The majority of respondents felt stressed and nervous prior to the use and, to a degree, during the use of SSCOs. A minority of respondents felt frustrated as they thought the process would be easier and/or quicker than a staffed checkout. The issue of frustration has been revealed in previous research (Bessière et al., 2006; Lazar et al., 2006; Bandura, 1986) and is linked to the issue of control, which was also raised by a minority of respondents. Control is observed as a key emotion and motivator in using SSTs (Oyedele & Simpson, 2007; Nysveen, Pederson & Thorbjornsen, 2005; Hoffman, Novak & Schlosser, 2003; Venkatesh, 2000). The majority of respondents felt controlled having to wait for assistance and/or service, and, to a degree, isolated by the process. These themes have been observed throughout this research and the literature (Oyedele & Simpson, 2007; Nysveen, Pederson & Thorbjornsen, 2005; Hoffman, Novak & Schlosser, 2003; Venkatesh, 2000) and will be an area for future empirical research. In the interests of completeness, it should also be noted that a minority of respondents felt indifferent about the process, and indicated they felt "nothing." A further respondent stated that they felt excited by the process, as it was a new experience for them.

3.6. Future use of SSCOs by respondents

The majority of respondents indicated that following the repeated use of SSCOs during their time in Scotland, their opinions had not changed, and those respondents felt the interaction with the technology was in line with their expectations. In the future, they would prefer not to use SSCOs again. Reasons for any future use are related to being in a hurry, long queues at staffed checkouts or in the case of one respondent, feeling sad (Tab. 8), which was again indicated by the same respondent when asked about possible circumstances for the use of SSCOs. Sadness as a reason for the use and the future use is an interesting finding and gives further insight into the rationale for the preference of the technology, which is related to the desire to be left alone, arguably wanting to be in control of the parameters of their personal engagement. Sadness as a feeling is related to emotion and the control debate when an individual does not wish to interact with anyone and may choose to use an SSCO. This, perhaps, eludes to one of the negative aspects of SSTs, the lack of human interaction, unless, of course, it is the sense of control perceived because of staff intervention.

A minority of respondents felt that their opinions had changed and that they now looked favourably

Tab. 8. Themes that emerged in relation to the future use of SSCOs

Theme	Representative quote
Has not changed — Would only use again in the case of rushing or long queues at staffed checkouts	"my opinion hasn't changed. I would only use self-scan in the future if I'm in a hurry and the queue is too long"
Has not changed — Would only use it again if they were sad	"sad and I don't want to speak to anyone"
Has changed — SSCOs were not as quick as they first thought	"it's meant to be quicker but [having used SSCOs] I think it's slower than staffed check-outs"
Has changed — SSCOs were less complicated and quicker than first thought	"firstly, I thought it's too complicated, but usually it's quite simple and I like to speed the purchase up"
Has changed — SSCOs allowed more control	"I like the self-service and will use it in the future. I find it very comfortable and I like to have the option, handle the speed of scanning/buying on my own"

Tab. 9. Themes that emerged regarding recommendations for SSCOs

Theme	Representative quote
More staff to be employed in and around the SSCO area	"there should be more members of staff who can help the customer, so that the progress stays quickly"
The need for more space	"it would be helpful to have an area where I can store my bag or umbrella so that there are no unexpected items in the bagging area"
Ensure SSCOs worked every time	"if everything works, there will be no frustrations anymore, but if the machine doesn't work without failures then the customer will be getting angrier and more frustrated"

towards SSCOs and would use the technology again, citing being in control, able to scan at one's own pace as the main reason for future use. These findings reinforced the previous commentary given in the research and the commentary given in the literature, namely, that respondents used SSCOs for convenience and to save time (Turner & Borch, 2012; Lee et al., 2010; Dabholkar, Bobbitt & Lee, 2003; Fitzsimmons, 2003; Meuter et al., 2000). Of the minority of respondents whose opinions had changed following repeated use of SSCOs, many reiterated the claim that the technology was not as quick and convenient as they first thought it would be.

3.7. Respondent recommendations regarding the design and usability

To address the issues concerning dissatisfaction and frustration with SSCOs respondents were asked to suggest improvements. There were three main themes to emerge from the responses (Tab. 9) and some one-off suggestions. The first theme to emerge and which is linked to a common theme to arise from the research overall, was that the majority of respondents indicated the need for more staff to be employed in and around the SSCO area. The second theme raised by several respondents was the need for more space (a minority suggested raising the tables on either side of the terminal) for allowing customers to pack their products into bags and store their personal items. The third theme raised by several respondents, as a means of reducing more customer frustrations was to ensure SSCOs worked every time. Some respondents added suggestions regarding the improvement of the infrastructure, such as weighing and the onscreen communication, employing more staff that were trained to use phrases such as "now it will work" and/or "okay, it is working now."

Other one-off comments provided by respondents included the need for barcodes on all sides of the product; a better scanner, which recognised more products, which links to the third theme that emerged from the responses. One respondent suggested having the dispensing of coins and cash closer together. Clearer instructions at eye level on the scanning process was mentioned by one respondent with a Q&A poster, which outlines typical SSCO problems and suggested solutions mentioned, by another respondent. One respondent suggested a money-off coupon being dispensed if the customer encountered a problem with the SSCO as a means of addressing customer frustrations. Surprisingly, given the common theme to emerge from this research, only two respondents felt there was a need for more user autonomy, one indicated it would be useful to allow

users to delete items wrongly entered without having to ask for assistance and another respondent requested a button to be installed in the checkout area to ring for help which gives customers more autonomy over minor scanning and transactional issues.

As we can observe from the respondent suggested recommendations, with the exception of the need to expand the checkout area and to increase the number of employees to assist customers using SSCOs, the other recommendation reflects the themes to emerge from the research regarding technical and processual issues with the technology (Dillon, 2010; Meuter et al., 2000). Respondents understood that self-service by its very definition requires to be quick and convenient; their recommendations of having more staff to expedite the transaction would assist with this, however, integrating more staff may also have the negative effect of further controlling customers and, perhaps, slowing down the process even more. Therefore, the recommendation regarding ensuring that SSCOs worked every time, although difficult, some may say improbable to achieve, is perhaps a better option to aspire to, in conjunction with investigating the use of space around the checkout area to reduce negative emotions experienced by customers, those feelings of irritation, frustration and, ultimately, dissatisfaction.

Conclusion

This study examined consumer perceptions and experiences with SSCOs, consolidating research in the area of consumer interaction and experiences with SSTs in general and SSCOs in particular. The study also took research forward with regards to attempting to understand the emotional relationship customers have with the technology and suggested potential solutions to reduce customer dissatisfaction and frustration. The research found that the majority of respondents were motivated to use SSCOs because of time-saving and convenience. The research also revealed, however, that some respondents acknowledged that SSCOs were not always quicker when compared to staffed checkouts, because of technical issues, lack of staff assistance and the impersonal, sometimes stressful nature of interacting with the technology in cramped conditions.

Although a minority of respondents felt positive about SSCOs as a platform to provide consumers with a choice, most respondents perceived the shopping experience negatively. The majority of respondents felt isolated, controlled and frustrated by the cumulative effect of time delays caused by technical and processual issues within a restrictive environment. This negative experience influenced the majority of respondents and their decision not to use the technology again unless certain situations occurred, i.e., situations which centred on convenience, namely a small number of items, being in a hurry, and/or long queues at staffed checkouts. The majority of respondents' opinions did not change from their initial perceptions and indicated that they would prefer not to use the technology in the future.

The findings gave rise to particular areas for future research. In the first instance, a future study may investigate customer preference for using staffed checkouts for bulky items. Although this research made the logical assumption that respondent rationale was related to the product being more difficult to scan, i.e. finding the barcode and positioning the product in front of the scanner, further research is required to understand the underlying reasons for these responses. Secondly, future research should explore the impact of staff (physical or virtual) on the user experience of SSCO technology to ascertain whether providing more verbal cues and explanation to users would prove beneficial and whether there is a need for better training of staff or the incorporation of further automation or digitisation in the process. Thirdly, future research should also further investigate respondents' emotional engagement with the technology, examining the motivation for the use and the feelings of isolation, anxiety, frustration and being controlled while using SSCOs utilising visual and physiological techniques. This future research will be able to conceptualise and empirically test customer perceptions and experiences, ultimately informing research into better customer engagement with SSCOs.

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Linking a performance management system and competencies: qualitative research

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ABSTRACT

The main purpose of the paper is to identify the group of indicators that are most widely used in the manufacturing area worldwide, to identify the responsibility and authority for measuring and evaluating business performance, and to create an illustrative competency-based model for a performance management system within a business. The paper covers two areas that are important in the maintenance of sustainable business performance. The first area focuses on a performance management system and its key performance indicators as an important element in every performance management system within a business. The article also presents the theoretical background of the Z-MESOT method, which is applied to define the consistency of these indicators in practice. The second area is dedicated to defining a competency-based model and competences related to the measurement and assessment of performance, which have been extracted from other general competences. This paper presents findings from qualitative research to eliminate the bottlenecks of the Z-MESOT matrix that was transposed into a questionnaire. The questionnaire, as well as structured interviews, helped identify differences in responsibility attributes of the Z-MESOT matrix regarding the size of the researched businesses. The paper offers a list of competences related to the key performance indicators that can be used for following theoretical and practical research.

KEY WORDS

competences, Z-MESOT, performance management system, key performance indicators

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Introduction

This paper continues the research started by Závadský, Korenková, Závadská, Kadárová and Tuček (2019). The previous research was based on the most frequently used key performance indicators worldwide. This paper uses the same indicators but also offers a deeper view of theory and practical implications, which is a novelty.

The paper has several research objectives. The first objective is to identify the group of indicators that are most widely used in the manufacturing area worldwide. The second objective is to identify the

responsibility and authority for measuring and evaluating business performance according to attributes of the Z-MESOT method. The application of the responsibility and authority as a necessary element of competences in the management process enables to interlink the organisation's requirements and the employee's opportunities in a way that permits their development in mutual harmony and to ensure the organisation's competitiveness (Königová & Hron, 2012; Szczepańska-Woszczyna et al., 2015). The competency-based approach in Performance Management System (PMS) focuses on the behaviour and performance of managers and employees of the organisation as well as on defining essential activities they perform, which is a key to success of the entire organisation (Kubeš et al., 2004 in Lišková and Tomšík, 2013). When applying the competency-based approach to PMS, the identification of competences is a vital step of the company's philosophy.

The third objective is to create an illustrative list of competences of the performance management system within a business, because "competences are connected with the future orientation and a developmental focus as they allow the inclusion of success factors" (Krausert, 2009, p. 185). Traditional job definitions that are replaced by frameworks of competences are supposed to be backwards-oriented because they are derived using job analysis methods (Kalyani, 2016). Competency-based PMSs have been tightly linked to the efforts of companies to create a setting for the empowerment of their employees to increase their competitive advantage, innovation, effectiveness, and performance (Draganidis & Metzas, 2006), but it has also been related to corporate efforts to utilise a company's internal knowledge (Konigová & Hron, 2012), personal development (Campion, 2011), and know-how sharing (Vazirani, 2010).

Well-established companies are characterised by the apparent stage of development as perceived by their employees. These organisations consider staff as an asset or a resource rather than variable costs, and it is, therefore, necessary to regard them as human capital (Campion, 2011; Armstrong & Taylor, 2014). To provide a long-term, sustainable and quality-driven production within a business, selecting and hiring the right employees is a key. An employee selection procedure has become a complicated process loaded with uncertainty (Dolobac, Mura & Svec, 2016). Using the resource-based approach to achieve a competitive advantage means perceiving an organisation as a unique set of resources and competences, based on which a strategy for the best possible use of opportunities is defined. According to Königová and Hron (2012), the use of competences in the management process enables to interlink the organisation's requirements and the employee's opportunities in a way that permits their development in mutual harmony, and to ensure the organisation's competitiveness in the market.

The paper is structured as to offer a literature review focused on performance management systems and the competence-based approach in performance management systems, defining the Z-MESOT method from theoretical and practical points of view, analysing the qualitative research finding in the performance management system, and defining the list of competences related to key performance indicators used in sample enterprises.

2. Literature review

2.1. Performance management system

Flapper, Fortuin and Stook (1996) offered a systematic method for designing a consistent performance management system to be used in practice with the focus on the relations between the performance indicators (PIs). In their view, a consistent performance management system (PMS) meant a system that covered all aspects of performance that are relevant to the existence of an organisation as a whole. The system should equip the management with a quick insight into the performance of their organisation's tasks and the extent of the implementation of organisational objectives. The method consists of three main steps: (1) defining performance indicators, (2) defining relations between performance indicators, and (3) setting target values or ranges of values for performance indicators. Ferreira and Otley (2009) described the structure and operation of performance management systems (PMSs) in more holistically. In general, literature uses three important terms: (1) management control system, (2) performance measurement system (PMeS) and (3) performance management system (PMS). From one point of view, the type of system is irrelevant because performance indicators can be found in each one. In their research, Závadský and Hiadlovský (2014) focused on performance indicators and especially their attributes that need to be defined.

From another perspective, PMS is an excellence model that includes requirements for measurement

and evaluation of performance efficiency. Several models of the kind are available. Based on the Malcolm Baldridge Award, Evans, Ford, Masterson and Hertz (2012) explored ways to further improve and achieve higher levels of performance. Abdullah, Hamid, Mustafa, Husain, Idris, Suradi and Ismail (2012) offered organisations a conceptual framework for the development of a value-based total performance excellence model (VBTPEM). In the model, the core values of an organisation are used as a strategic component use to achieve total performance excellence. It integrates the intangible parts of performance measurement that have become pivotal for many organisations. The study by Doeleman, Have and Ahaus (2012) focused on the moderating role that leadership plays in the relationship between management control as part of total quality management (TQM) and business excellence aimed at targeted change. The study also indicated that transformational leadership had the most influence on the relationship between the construct of management control and purposive change. In the context of transformational leadership, organisations can be strengthened by implementing a management control system used in combination with a thorough management communication approach. Wang (2012) presented a literature review indicating the lack of an appropriate framework for the assessment of organisational performance (OP) during a crisis. He identified key OP indicators and developed a multidimensional framework for the evaluation of OP during crises. Alfaro-Saiz, Carot-Sierra, Rodriguez-Rodriguez and Jabaloyes-Vivas (2011) described the ways to use information resulting from the application of the EFQM excellence model to analyse perceptions of the organisation held by its members based on their business vision. Heras-Saizarbitoria, Marimon and Casadesús (2012) presented an empirical study focused on the relationships between categories of the EFQM model. Lis and Szczepańska-Woszczyna (2015) linked the organisational performance with the necessity to create individual, long-lasting relationships between the company and the customer. Performance is viewed differently, yet neither of the views on PMS served the starting point of research by Závadský and Hiadlovský (2014), which rather dealt with the homogeneity of any of these performance systems with PIs as their basic element.

2.2. Position of competences in a Performance Management System

In the literature, terms competence, competency, ability, responsibility and performance can be encountered on a daily basis. It can be argued that these terms are often placed within a more empirical rather than a theoretical framework. With the evolvement of scientific disciplines, including business management, various performance management systems (i.e. Performance Management, Business Performance Management, and Corporate Performance Management), and Human Resources Management, new knowledge has been acquired, contributing to new and convoluted interpretations and understandings of the terms. As some of these definitions are still used interchangeably, extensive and, in many cases, chaotic debates continue on the actual meaning and composition of these new notions.

Various authors (Draganidis & Mentzas, 2006; Vakola, Soderquist & Prastacos, 2007; Vazirani, 2010) consider "competence" and "ability" as interchangeable terms. Throughout an employment relationship, an employee executes certain tasks that are beneficial for his/her employer. His/her employment includes specific tasks, duties, authorities and responsibilities. Simultaneously, an employee has to socially mature in terms of his/her practical skills and determination.

Armstrong (2007) referred to competence as an expert's ability and competency expressed in certain anticipated behaviour, or a type of behaviour, which is necessary to reach expected goals through teamwork, communication, team leadership and decision-making. Bober (2008) assumed that competence could be literally translated as power or authority. Power is closely linked to responsibility for a specific performance. Vazirani (2010) characterised competence as the minimum standard of work performance, and competency as a description of how to reach certain performance standards for businesses.

In the last six years, competence has been defined as the social and individual maturity of an entity (Porvazník, 2007; Vazirani, 2010). Competences are understood as a set of behaviours or internal qualities of individuals executing their responsibilities. In many cases, the authors refer to it as the internal characteristics of an individual and his/her motivation to undertake necessary efforts. It is assumed by the authors of this article that these preconditions are understood as an ability rather than competence.

It is necessary to proceed to a detailed and unambiguous definition of the issue under the current

analysis. According to Minárová, a work position is defined by "duties to be executed and powers we need for proper execution and responsibility for using such powers when carrying out a specific duty which can be referred to as a competence" (Minárová, 2014, p. 49). However, a work position is limited by "personal requirements of a candidate occupying a specific work position, i.e. general and expert knowledge, practical and applied abilities, social and personal maturity, which are all referred to as abilities" (Minárová, 2014, p. 49). According to Porvazník (2007, p. 24), this term "clarifies what duties, powers and responsibilities an individual or a group of people (a team or an organisation, an institution or an authority) should have." Competence is understood as all the duties, powers and responsibilities related to a particular work position regardless of who will be in charge of a specific competence. From this point of view, competences form a comprehensive strategy to facilitate the peak employee and organisational performance (Kalyani, 2016; Vazirani, 2010).

Seková et al. (2013) and Manohar (2017) defined competency as an ability to execute duties and powers (authorities) effectively and to take responsibility for one's actions. They perceived the word competency as preparability of the management subjects — shareholders, managers and employees — to manage and govern their work, or the work of others to create real added value as the main key to success. The linkage of competences to performance management is that competences indicate what the employee can do or has the ability to do and the performance management system indicates what the employee does. Vakola, Soderquist and Prastacos (2007) added that competences, in contrast to competencies, could be delegated and competency can only be acquired through knowledge and experience.

As mentioned above, it may be assumed that an employee's competency includes his/her abilities and competences. Being able to carry out one's duties and being engaged are the main characteristics of one's ability including the following key assets (or personal characteristics): general and expert (professional) knowledge (1), practical and applied abilities (2), social and personal maturity (3), and self-motivation (4).

Competence relates to certain conditions that have to be respected to execute certain work duties. Therefore, competence consists of duty (1), power or authority (2) and responsibility (3). Excellent performance is achieved by the assignment of work duties, powers and responsibilities to employees that have mixed abilities, knowledge, practical skills, social and personal maturity and self-motivation. Appropriate design of roles and responsibility sets are the key to a successful performance management system.

As all the phases of performance measures include a human factor, professional, practical and social requirements have to be determined for those businesses which have an obligation or are entitled to and liable for a measurement process and business performance evaluation (Moore, Cheng & Dainty, 2002). The ambiguous and vague definition of competences demonstrable by staff members responsible for measuring and evaluating their company's performance process may result in incoherences and disorganisation. Examples of staff members responsible for measuring and evaluating their company's performance are shareholders, top managers, company auditors, junior managers, members of t the controlling department etc. An employee to whom a competence for measurement process and performance evaluation has been delegated, is solely responsible for the quality of the performance management process (Wagner, 2009).

The predetermined arrangement of competences is a general and key feature of a competence model. According to Vazirani (2010), the majority of competence models include 10 to 12 competences to be classified into various categories. A competence model can be regarded as one of the subsystems of business process management as it creates a relation between activities and their implementors (Sanchez & Levine, 2009; Manohar, 2017). A competence model is a simplified system of business management, including such elements as business activities or human resources. A competence model can identify real responsibility for the performance of a fundamental management level. In summary, a business competence model aims to define the responsibilities and powers of specific work positions for the execution and implementation of particular activities (Závadský, 2012). Various problems can be solved, and direct consequences can be drawn by active engagement of employees in explicitly defined responsibilities and their acceptance (Wagner, 2009; Verle et al., 2014; Olšovská, Mura & Švec, 2016). When a company creates its system, it is necessary to tailor it according to certain parameters, such as the size of the company, the production programme, company culture and ways of doing business (Tuček & Dlabač, 2013).

2.3. Z-MESOT method as a tool for systematic performance measurement and evaluation of a business

The Z-MESOT framework represents a managerial and systematic approach to measuring and evaluating performance. It is mainly used when assessing the degree of consistency within measurement systems and performance evaluations. The managerial and systematic approach is based on the determination of the attributes particular to specific indicators used for the measurement and evaluation of business performance. Consistency is usually defined as an agreement or compatibility, especially uniformity among the parts of a complex matter. Ensuring consistency within any system is a guarantee for long-term balance (Závadský et al., 2016). The tool, for which consistency of the performance measurement and evaluation systems is identified, is often referred to as the matrix Z-MESOT, as shown in Tab. 1.

Tab. 1. Z-MESOT Matrix

		1	...	i	...	n	
		Performance Indicator PI_1	...	Performance Indicator PI_i	...	Performance Indicator PI_N	ΣA_i
F1	Name of the PI	1 ∨ 0	...	1 ∨ 0	...	1 ∨ 0	<0,n>
F2	Relation to the business process	1 ∨ 0	...	1 ∨ 0	...	1 ∨ 0	<0,n>
F3	Relation to the strategic goal	1 ∨ 0	...	1 ∨ 0	...	1 ∨ 0	<0,n>
F4	Strategic goal (name and sign of the strategic goal)	1 ∨ 0	...	1 ∨ 0	...	1 ∨ 0	<0,n>
F5	Responsibility for the PI's definition	1 ∨ 0	...	1 ∨ 0	...	1 ∨ 0	<0,n>
T1	Responsibility for the target value definition	1 ∨ 0	...	1 ∨ 0	...	1 ∨ 0	<0,n>
T2	Unit of the PI	1 ∨ 0	...	1 ∨ 0	...	1 ∨ 0	<0,n>
T3	Period defined for the target value achievement	1 ∨ 0	...	1 ∨ 0	...	1 ∨ 0	<0,n>
T4	Determinants of the target value definition	1 ∨ 0	...	1 ∨ 0	...	1 ∨ 0	<0,n>
T5	Target value (number)	1 ∨ 0	...	1 ∨ 0	...	1 ∨ 0	<0,n>
I1	Responsibility for the data recording	1 ∨ 0	...	1 ∨ 0	...	1 ∨ 0	<0,n>
I2	Frequency of data recording	1 ∨ 0	...	1 ∨ 0	...	1 ∨ 0	<0,n>
I3	Place for data recording	1 ∨ 0	...	1 ∨ 0	...	1 ∨ 0	<0,n>
I4	Source of data	1 ∨ 0	...	1 ∨ 0	...	1 ∨ 0	<0,n>
I5	Calculation formula	1 ∨ 0	...	1 ∨ 0	...	1 ∨ 0	<0,n>
I6	Automation of the calculation (manually/software)	1 ∨ 0	...	1 ∨ 0	...	1 ∨ 0	<0,n>
E1	Responsibility for the PI's evaluation	1 ∨ 0	...	1 ∨ 0	...	1 ∨ 0	<0,n>
E2	Frequency of the PI's evaluation	1 ∨ 0	...	1 ∨ 0	...	1 ∨ 0	<0,n>
E3	Visualisation of the achieved performance	1 ∨ 0	...	1 ∨ 0	...	1 ∨ 0	<0,n>
E4	Action in case of a performance gap	1 ∨ 0	...	1 ∨ 0	...	1 ∨ 0	<0,n>
E5	Warning signal for the evaluator	1 ∨ 0	...	1 ∨ 0	...	1 ∨ 0	<0,n>
	ΣA_j	<0,21>		<0,21>		<0,21>	

Source: (Závadská & Korenková, 2017).

The parameters for measuring the functionality of a system are represented by so-called Performance Indicators (PI). Every Performance Indicator is used to research the functionality of a partial structure or the whole business process. Defining a consistency rate is the basis of systematic characteristics. A proposal for the attributes of performance measurement and evaluation should be in line with a systematic approach to its management. A consistent basis for a performance management system is a model comprising the Z-MESOT matrix. This matrix contains 21 attributes for testing the consistency of a performance management system. From the methodological point of view, it is necessary to differentiate between the attributes by particular patterns even though all the attributes end up being integrated into only one indicator. The Z-MESOT matrix contains 21 performance indicators divided into four groups (F1–F5 — formal attributes, T1–T5 — attributes of the indicator's target value, I1–I6 indicator's measurement, E1–E5 — indicator's evaluation) (Závadská & Korenková, 2017).

This paper presents the analysis of attributes related to responsibility as a fundamental part of competences listed in the Z-MESOT matrix (Tab. 1) necessary for managers as well as other employees. Regardless of the method of performance measurement and evaluation, every business entity has to execute these activities as part of their business. Závadský and Kovaľova (2011, p. 4) assumed that the "implementation of specific activities is always delegated to an individual employee or managers in charge of the outcomes of business processes as well as its stability." The Z-MESOT method supports a systematic approach towards the performance measurement and evaluation considering a competency-based approach. Z-MESOT is interlinked with a competence approach when it comes to those attributes defining responsibility in the business performance measurement and evaluation. The Z-MESOT matrix includes four basic attributes defining responsibility: the responsibility for defining an indicator — attribute F5 (1), the responsibility for defining a target value — attribute T1 (2), the responsibility for performance measurement — attribute I1 (3), and the responsibility for performance evaluation — attribute E1 (4).

Attribute F5 from the Z-MESOT matrix is the first important responsibility attribute. Indicators are usually defined by process owners, level managers or even first-level management. It is highly important to define the responsibility for determining its target value T1. When defining an indicator, it is often recommended to determine its target value as well. It is fundamental to appoint an employee in charge (I1) who will be responsible for monitoring the values at the right periodicity (or at the right time) and the right place. In many cases, the responsibility for an indicator's evaluation (E1) is often connected with the responsibility for defining a target value, i.e. when a manager is supervising his/her own indicators. The responsibility for evaluation is also linked to operative performance evaluation. This is performed by company managers or top management (Závadský, 2005; Závadský & Hiadlovský, 2014).

3. Qualitative research in the selected companies using the Z-MESOT method

A paper form was used to conduct the study, and qualitative research methods were employed to collect and analyse important data with an emphasis on attributes of the Z-MESOT method related to the responsibility for measuring and evaluating performance.

A qualitative approach was used due to the complexity of the analysed issue. The competence model does not consider or explicitly define the variety of available approaches to measurement and performance evaluation systems related to their effectivity, specific responsibilities and powers. The content of the research is rather complex and, therefore, appropriate methods of qualitative research should be used.

In general, qualitative research is focused mainly on small groups of respondents and, therefore, the research sample was rather limited (only 12 enterprises).

All included companies were small and medium-sized enterprises with foreign shareholders, which had already implemented performance measurements and evaluation systems. Based on the theoretical background, a list of 15 key performance indicators was made. New trends in performance measurement and evaluation highlighted the fact that performance does not only concern the measurement and assessment of financial or quantitative indicators. It is necessary to reflect other fields of business (effectivity, productivity etc.), which can not always be measured by way of financial indicators. Thus, the chosen KPIs include both current financial and non-financial indicators of business performance, such as finance

and marketing, flexibility, productivity, quality, supplies, production efficiency, defects and failures.

Based on theoretical results and the key performance indicators for business performance (Anand & Grover, 2015; Lin et al., 2011), the following 15 KPIs were further explored by means of a questionnaire:

KPI1. On-Time Delivery,
KPI2. Manufacturing Cycle Time,
KPI3. Capacity Utilisation Rate,
KPI4. Overall Equipment Effectiveness,
KPI5. Inventory Turnover,
KPI6. Manufacturing Costs as a Percentage of Revenue,
KPI7. Productivity in Revenue per Employee,
KPI8. Earnings Before Tax, Interest, Depreciation and Amortisation EBITDA,
KPI9. Overall Labour Effectiveness,
KPI10. Customer Reject Rate,
KPI11. Defects per Million Opportunities,
KPI12. Suppliers Quality Incoming,
KPI13. Customer Satisfaction,
KPI14. Cash Conversation Cycle (CCC),
KPI15. Total Recordable Health and Safety Incident Rate.

Twelve businesses participated in the analysis of their data, seven of which were classified as large enterprises (public limited companies), and five were medium-sized industry businesses (limited companies). The companies differed considerably in terms of their field of business, e.g. textile, leather and apparel manufacturing, plastics and rubber products manufacturing as well as machinery and equipment manufacturing.

The qualitative approach consisted of several basic phases (Fig. 1). Phase one was named "research conception" because it involved defining the research problem together with its main goal and questions in the form of a structured interview. The purpose of qualitative research was to identify responsibilities and powers when measuring and evaluating business performance to create an illustrative competence model of the performance management system. Within this phase, a questionnaire based on the Z-MESOT method was created. This questionnaire had several functionalities. The questionnaire made it possible to identify a consistency rate of performance measurements and evaluations and also identify "TOP 5 KPIs" of the selected enterprises when measuring and evaluating their business performance. Finally, specific work positions were categorised in terms of the responsibility for defining attributes of the selected KPIs.

Phase two includes generating and collecting the data. As the analysed issue is rather complex and difficult to research, individual structured interviews with managers in charge of performance measurement and evaluation were held. The managers were all running medium-sized and small enterprises in Slovakia. Since the matrix came across as rather complicated when first introduced to participants, three separate meetings were arranged with each company. During the first meeting, managers were acquainted with the basis of the Z-MESOT method, its goals and research methods. The second meeting was dedicated to the analysis of KPI attributes and an open discussion regarding the university's standpoint from a more applied and practical business environment. An agreement on the findings was then concluded at the final meeting, which again served as a basis for this research.

The businesses that took part in the structured interviews came from a wide variety of fields. The first round of interviews was conducted in March 2017 and focused mainly on managers/directors who were responsible for quality management systems, integrated management systems or quality management processes including performance measurements and evaluations. The participants admitted that performance measurements and evaluations were important tools for successful company management. The participants also considered the Z-MESOT method not only as a tool for the identification of the consistency rate but also as a new management style within a business or its departments. For the majority of the businesses analysed, the company performance is seen as an important part of quality management.

Phase three of the qualitative research consists of analytical and interpretational approaches. This type of research is characterised by complex, "thick" and

Fig. 1. Qualitative research phases

disparate data. One data set can be used for all other analyses having a different specialisation (a competence model — the attributes of responsibility, consistency identification — all the attributes).

The last two phases of qualitative analysis consist of description and classification of work positions which are related to the attributes of the Z-MESOT matrix aiming to develop a competence model for performance measurement and evaluation of a business. The main goal was to understand the issue in more detail from a practical, as well as a theoretical, point of view. A practical view is presented by the viewpoint held by managers because the topic of our analysis represents an inseparable part of their daily duties. The research was carried out on the basis of the practical context of the respondents, their experience and perspectives.

3.1. Results of the qualitative research

The businesses were classified according to the type of production as KPIs were implemented differently in businesses focusing on custom manufacturing in comparison to those who focus on mass production or a combination of these two types. One large and two medium-sized businesses specialised in custom manufacturing accounted for 25% of analysed businesses. The majority of the businesses, i.e. four large companies and three medium-sized companies, specialised in mass production, which accounts for 58.33%. Two of the larger businesses were considered to be a combination of mass production and custom manufacturing as they focused on customer needs. These companies accounted for 16.67%.

As all of the proposed indicators were tightly linked to the attributes of responsibilities in large businesses (through process owners, as defined by the business information systems), they differed considerably in medium-sized enterprises, as mentioned below in the analysis of particular KPI attributes.

The first KPI was defined by all the large and medium-sized businesses as a key performance indicator. In large businesses, the Logistics Director (the owner of logistics processes) is responsible for defining the indicator and its target value to minimalise, or at least maintain it, in case it is determined by a customer as well as for performance evaluation. Large businesses stated that they were trying to eliminate human failures, which could result in inaccurate KPI measurements or mistakes in performance indicator measurement and evaluation. They assumed that attribute I5 was defined by a specific ERP system which was implemented and used in large businesses. It could, therefore, be assumed that in large businesses, the same person, i.e. the process owner, was responsible for defining the indicator as well as its target value and measurements. However, the same fact could not be applied to medium-sized enterprises. In this instance, it was the Operations Manager who was responsible for defining KPI 1, i.e. for increasing the percentage of customer orders that arrived on time and were tailored to customer requirements. A target value in medium-sized enterprises was determined by the Operations Manager in cooperation with the Logistics Supervisor, whereas in two out of five businesses analysed, it is only a Logistics Supervisor who acted without any cooperation with the Operations Manager. Logistics engineers were in charge of KPI 1 measurements as they collect all the necessary data to be further evaluated, either by a Logistics Supervisor or an Operations Manager.

Manufacturing Cycle Time (hereinafter — KPI 2) was defined by all the analysed large and medium-sized enterprises as a key performance indicator. In large businesses, the attributes of responsibility (F5, T1, E1) were connected with owners of specific processes, to which the indicator belonged. Based on structured interviews, it was found that in four businesses, this indicator was measured and evaluated by the logistics department headed by the Logistics Director, while three businesses had this incorporated in the main production process supervised by their Manufacturing Director. In medium-sized enterprises, this role was delegated to the Operations Managers to reduce the amount of time taken to produce a product and ship it to customers. The indicator's target value was usually determined in cooperation with the Operations Manager and the Production Supervisor. In medium-sized enterprises, such responsibilities were usually delegated to lower management, i.e. the Production Supervisor, which depended on the measured values (recording downtime or time that is needed for retyping manufacturing facilities) in cooperation with production operators. Operations Managers were fully responsible for the evaluation of the indicator in all of the analysed businesses.

KPI 3, i.e. the Capacity Utilisation Rate, was also considered to be a key performance indicator. In all the large businesses we analysed, the owner of the main production process, namely the Manufacturing Director, was in charge of defining the indicator, its target value as well as its evaluation. The Director would also focus on maximising the indicator's value

to increase the total utilised manufacturing output capacity. In all of the analyses medium-sized businesses, the Operations Manager was responsible for the four attributes of the KPI 3 indicator. In other words, it is possible to talk about the explicit definition of all the responsibility attributes.

Based on the structured interviews, the indicator OEE – KPI 4 was regarded as a key feature only by seven of the mass production businesses. In contrast, this indicator was not considered crucial by custom manufacturing businesses as their production facilities were quite heterogeneous or not identically used (depending on the type of production, to meet customer requirements). As a result, the OEE indicator did not always belong among key performance indicators. For mass production businesses, however, this indicator was one of the most fundamental features. As far as responsibility attributes in large businesses are concerned, three custom manufacturing businesses did evaluate partially the attribute but did not define it explicitly. In the remaining four businesses, the Manufacturing Director was responsible for defining the indicator; while in large businesses, Managers or Chiefs of Departments dealt with the evaluation of the OEE indicator. Two medium-sized enterprises did not have responsibility attributes explicitly defined for the indicator. The remaining three businesses considered the Operations Manager to be responsible for the definition and evaluation of the indicator. The structured interviews showed that specific responsibility attributes were delegated to different employees and, therefore, these were not strictly defined. The target value was not determined only by the Operations Manager, but also by Maintenance or Improvement Supervisors. Besides Maintenance and Improvement Supervisors, there was also the Quality Manager, but only through his/her formal job description. Indicator values were measured by production operators managed by the Production Supervisor. In two of the businesses, it was the Operations Manager who was responsible for measuring the OEE indicator, and one medium-sized respondent indicated a Maintenance and Improvement Supervisor. An inaccurate delegation of responsibility may result in incorrect approaches to its measurement and evaluation. When duties, authorities and responsibilities are not properly defined, this may give rise to numerous arguments among staff on different management levels and eventually lead to a drop in performance of the whole business.

The Inventory Turnover indicator, referred to as KPI 5, was considered a key performance indicator. In large businesses, responsibility attributes of the Z-MESOT matrix were clearly defined by the owners of the processes, i.e. Logistics Directors. In medium-sized enterprises there was the Operations Manager responsible for defining the Inventory Turns indicator and the Logistics Supervisor who was in charge of determining the indicator's target value as well as its evaluation. The Operations Manager would then evaluate the two processes. There were various people responsible for measuring the Inventory Turns indicator, e.g. Logistics Engineers who managed Logistics Supervisors followed by Production Supervisors and Assembly Coordinators in three cases. However, two of the businesses did not define the I5 attribute. This might be an indicator of inconsistency in defining responsibility attributes of the measurement and performance evaluation systems.

KPI6, i.e. the Manufacturing Costs as a Percentage of Revenue attribute, was regarded as a key performance indicator by all of the analysed large businesses. However, medium-sized enterprises classified it only as a performance indicator despite its regular measurement and evaluation. The owner of financial business processes was fully responsible for its definition, determining its target value as well as its evaluation. In three of the large businesses, this work position was defined as the Purchase and Finance Director, while in the remaining companies he/she was referred to as the Finance Director or the Chief Financial Officer. In the case of medium-sized enterprises, there were various work positions related to responsibility attributes of the KPI 6 indicator. These were General Managers or any other representative within top management who was responsible for measuring and evaluating the given indicator. Their main goal was to focus on the reduction of total manufacturing costs. The whole process involved the Financial Controller who dealt with the finance while the Revenue and Operations Manager focused on planning, budgeting and manufacturing costs. However, the Financial Controller was considered to be fully liable for these processes in medium-sized enterprises.

Productivity in revenue per employee was often referred to as KPI 7 and classified as a financial key performance indicator by all of the analysed large enterprises. In the case of the KPI 6, all of the responsibility attributes were delegated to the Purchase and Finance Director or the Chief Financial Officer. However, in some large businesses, HR Managers and Operations Directors had some participation without being considered owners of financial processes;

therefore, they were not defined in the E1 attribute. Medium-sized enterprises regarded KPI 7 as a key performance indicator, which was almost identical to KPI 6 when it came to responsibility attributes. The only difference was the HR Coordinator who was responsible for the I1 attribute related to measurement in four businesses. Their main goal was to control and improve productivity in revenue per employee.

Earnings before tax, interest, depreciation and amortisation (EBITDA), hereinafter — KPI 8, were always referred to as a key performance indicator for all of the analysed large and medium-sized enterprises. In large businesses, it was the Chief Financial Officer, as a member of top management, who was responsible for defining the indicator and its target value. However, the Chief Financial Officer did not evaluate the indicator as he/she cooperated closely with the Financial Analysts. In medium-sized enterprises, the General Manager was in charge of the duties, while the target value of EBIDTA was determined by the Financial Controller. A bookkeeper was considered fully liable for measuring KPI 7 even though its evaluation was delegated to the Bookkeeper and the Financial Controller. Close to the KPI 8 was the KPI 14, referred to as Cash Conversation Cycle (CCC), was not considered to be a key performance indicator for the majority of the businesses we analysed, but rather a key indicator for cash-flow. This indicator emphasised possible fluctuations or a discrepancy between payables and obligations. In large businesses, it was the Chief Financial Officer who was responsible for the F5, T1 and E1 attributes. In medium-sized enterprises, the responsibility attributes were identical to other analysed financial indicators (e.g. KPI 8).

KPI 9 represents one of the most modern and the most sophisticated indicators which is supposed to become a highly important and significant metric measuring business performance of human resources in the future. Kronos Corporation from the USA (American Experts at Improving the Performance of People and Business) claimed that effective labour contribution was accomplished when managers could see and manage the three OLE elements — availability, performance, and quality (similar to OEE, but applied for HR). A manufacturer can improve shop floor productivity, and therefore the level of profitability, by understanding the interdependency and trade-offs of these three factors and managing them in real time. From among the analysed businesses, only one large corporation implemented this indicator, even though it was considered a PI rather than a KPI. Due to inconsistency in performance measurement and evaluation in the case of this indicator, the attributes F5 and T1 were not strictly defined. The HR Manager and the HR Counsellor were responsible for performance measurement and evaluation. Other large and medium-sized enterprises did not measure the indicator or did not even implement it into their practice.

Customer Reject Rate or KPI 10 did not represent a key performance indicator in the analysed large businesses (% of complaints was only considered as a performance indicator) while three of the medium-sized enterprises consider this indicator as a KPI. When it comes to responsibility attributes for KPI, it was assumed that the three analysed large businesses did not explicitly define the responsibility attributes. The remaining four large businesses defined this indicator vaguely and, therefore, they had to put a lot of effort into determining responsibility. It was discovered that in large businesses, a top management representative (the CEO) or the Chief Marketing Officer was responsible for defining the indicator. Meanwhile, the Quality Director defined the indicator's target value, the Quality Manager or the CRM Manager was in charge of measuring, and the Quality Manager was responsible for its evaluation. In the sample of analysed medium-sized businesses, this indicator was measured and evaluated by all the corporations, three of which considered it a KPI. The General Manager was responsible for its measurement and target value definition while the number of complaints was recorded and administered either by the Quality Manager or the Quality Assurance Engineer with the Quality Manager responsible for its evaluation. The Customer Satisfaction Index (KPI 13), which is related to KPI 10, was regarded as essential and fundamental only by the custom manufacturing businesses as this feature was not considered a key performance indicator in any of the analysed mass production businesses. However, all the enterprises measured and evaluated the indicator. Large and medium-sized mass-production enterprises did not explicitly define responsibility attributes as they were determined only in custom manufacturing businesses. It was the Chief Marketing Officer who was charged with responsibility attributes in large enterprises. In medium-sized enterprises, the responsibility F5 was delegated to the General Manager while responsibilities T1 and E1 were ensured by the Quality Manager with the Quality Assurance Manager in charge of measuring the indicators. There was no

marketing department in the company hierarchy of medium-sized enterprises operating in the production industry.

The Parts Per Million indicator was seen as a key indicator by all of the analysed medium-sized and large enterprises engaged in mass production. None of the custom manufacturing businesses evaluated or measured the indicator. As this indicator relates to various types of waste, defects and failures, its main purpose is to reduce the amount of these factors within a given process, though, mainly in manufacturing. The Quality Director was responsible for specific responsibility attributes in large enterprises while cooperating with the Quality Manager in the evaluation of the indicator. In medium-sized enterprises, it was the Operations Manager who was considered to be responsible for its evaluation and determining specific steps leading to the improvement or preservation of the required quality. The target value was set by the Operations Manager in cooperation with the Quality Manager. Many other employees were responsible for measuring the indicator, e.g. Production Supervisors, Production Operators, Assembly Coordinators, Process Engineers or Quality Control Engineers as the data were collected from different company departments and summarised by the Operations Manager. In medium-sized enterprises, the data were collected in writing, which might have affected its accuracy.

KPI 12, hereinafter — the Supplier's Quality Incoming, was not considered to be a key performance indicator (but rather an ordinary PI) by any of the large and medium-sized companies. In large businesses, it was the Purchase Director, or the Purchase and Finance Director, who was responsible for defining the indicators. The target value and its evaluation were delegated to the Quality Director as he/she would evaluate suppliers and input quality to increase the value of this particular indicator, but also to ensure the supply from a supplier at the right time, at the right place, in the right quality. In medium-sized enterprises, the General Manager was in charge of defining the indicator while its target value and evaluation is a competence of Quality Manager. The Manager dealt with integral evaluation of the measured data in cooperation with the Quality Assurance Engineer, the Assembly Coordinator or the Procurement Assistant.

The Total Recordable Health and Safety Incident Rate was the last indicator to be analysed. Some of the analysed businesses regarded this rate as a key indicator, while others did not. The large businesses outsourced this process and, therefore, there was no exact definition of the attributes F5 and T1. It was the Quality Manager or the HR Manager who was responsible for measuring the indicator, the Quality Director or the Integrated Management System Manager dealt with its evaluation. Three medium-sized enterprises did not clearly define the responsibility attributes of the KPI 15, while the remaining two businesses delegated this responsibility to the Quality Manager with the Quality Assurance Engineer being fully liable for measurements and evaluations of the KPI 15 indicator.

The structured interviews presented results of attributes from the Z-MESOT matrix related to responsibilities for the definition KPIs, the determination of target values of indicators, and the measurement and evaluation of the indicators. As a result of the research synthesis, two charts were devised, which included specific work positions in relation to certain attributes of responsibilities for every performance indicator while still respecting the criterium of the company size. The type of production seemed to be important when determining the top 5 KPIs from the proposed indicators (the indicators defined as TOP 5 KPIs in the mass production framework differed considerably from those of custom manufacturing businesses). In regard to the attributes of responsibilities, only minor differences in work positions occurred, mainly due to the company size. The main difference between large and medium-sized businesses was found in the degree and significance of process orientation. All the analysed businesses had detailed process maps at their disposal and defined owners of specific processes. These owners were responsible for "performance indicator management", which was either evaluated by an integrated business management system (Orion) or by using licenced management systems, such as Enterprise Resource Planning (e.g. SAP, Oracle, E-Business Suite, Qlick Sense/View). The effectivity of implementation of an ERP system was generally greater in large businesses. Besides, the ERP implementation was generally considered to be more effective/efficient in large businesses. The analysed medium-sized businesses mainly used Helios Orange or Green, Microsoft Dynamics Nav, Microsoft Dynamix AX, Exact Globe or simple spreadsheet applications, such as MS Excel, to measure and evaluate their business performance indicators.

4. Discussion and proposal of the competences related to KPI

Aiming to successfully adapt to a rapidly changing business environment, managers need to be proactive. Company managers need to utilise all the potential that exists within the company. Consequently, knowledge of the dramatic environmental changes is not the sole responsibility of the manager but also of employees, so that they can be independent but also contribute to the progress of the whole corporation (Meybodi, 2015). The paradigms of Human Resource Management (HRM) are adapting to changing demands of the working environment and the employees. Competency-based Human Resources are paradigm examples of HRM (Sanchez & Levine, 2009). HRM research is rarely associated with organisational performance. An integration of these concepts can be found in research conducted by Draganidis and Mentzas (2006), Bober (2008) and Konigova and Hron (2012). Meanwhile, this study aimed to examine the role of HRM and competence modelling to improve organisational performance by explicitly defining all the attributes related to responsibilities.

Based on the analysed indicators, we created nine competence models of performance management systems. The competences were assigned to particular KPIs based on the results of structured interviews with managers of analysed companies. These competence models of performance management systems consist of 15 indicators and work positions, which are defined in specific attributes of the Z-MESOT matrix. There are competences to be recommended (based on a specific indicator) linked to particular responsibilities. Competence models always include ten competences and three basic groups of competencies that are divided into Academic Competencies (general and expert knowledge — group one), Workplace Competencies (practical and applied abilities — group two) and Personal Effectiveness Competencies (social and personal maturity — group three) to draw a line between competences and abilities – competencies.

KPI 1 is an indicator of process and supply chain efficiency that measures the number of completed goods or services delivered to customers in time. This indicator helps determine how efficient a company is at meeting the customer requirements or/and agreed deadlines. The competencies in group one should include theoretical as well as practical knowledge of logistics, supply chain fundamentals, operations and management fundamentals, mathematics and statistics. Competencies listed in groups two and three are rather universal for any indicator that would be analysed (KPI 1-KPI 15). Competencies of the group two include e.g. problem solving, decision making, teamwork and collaboration, accountability, customer focus, managerial functions applied in practice, conflict management, analytical thinking, computer skills, stress resiliency, time management etc. Group three consists of integrity, continuous learning, effective communication, active listening, interpersonal skills and emotional intelligence. It can be generalised that KPI 1 has these ten essential competences:

- distribution design, sourcing and management duties,
- global trade compliance (mostly in large companies),
- sourcing and supplier management,
- supply chain continuity planning,
- transportation sourcing and contracts concluding,
- transportation, distribution, logistics tasks,
- distribution requirements planning, inventory management, demand management and its forecasting,
- work with ERP and MRP systems,
- risk management, warehouse management, supply chain synchronisation, strategic sourcing and purchasing, business strategy,
- standards (logistic area), process improvement, lean management, benchmarking.

KPI 2 is the average number of days generally required to process a work order, i.e. the time it would take for a customer's request for a product, standard as well as customised, to reach the appropriate manufacturing facility and be ready for shipping. The first group of abilities includes (in general) theoretical knowledge of logistics, manufacturing, mathematics and statistics, but also practical skillsets. Ten essential competences of KPI 2 are:

- manufacturing process design and development + continuously improving the manufacturing process,
- set up, operate, monitor, control and improve manufacturing processes and schedules,
- coordination of maintenance, installation and repair — optimise manufacturing equipment and systems,
- supply chain continuity planning,

- logistics — monitor the movement and storage of materials and products in coordination with suppliers, internal systems and customers,
- quality assurance and continuous improvement — ensure product and process meet QMS requirements,
- assure sustainable development and ecological principles of manufacturing,
- work with ERP and MRP systems,
- assurance of Health, Safety and Security — employ equipment, practices and procedures,
- standards (ISO...), process improvement, lean management and benchmarking.

KPI 3 is the percentage of capacity utilisation level, which gives insight into the state of the economy, or the state of a company, at any given point in time. Capacity utilisation is an important operational metric for businesses, and also a key economic indicator when applied to aggregate productive capacity. KPI 4 is a widely used performance indicator in manufacturing industries around the world. It is a measure of asset or equipment utilisation. OEE is indicated by the product of the availability index, performance index and the quality index. The first group adopts relevant industry and production knowledge and experience, operations management knowledge, IT skills, project management knowledge, maths and statistics knowledge etc. Ten essential competences of these two KPIs can be generalised:

- coordinate, manage and monitor the working and its progress of production departments in the company,
- review financial statements and data, prepare and control operational budgets, inventory and plan effective strategies,
- improve processes and policies, formulate and implement procedures to maximise output and effectiveness, monitor adherence to rules and procedures,
- monitor and evaluate the performance of the employees, the equipment being used and the entire company,
- ensure the production teams have enough time to manufacture and deliver products for customers as well as general time management,
- responsible for production, procurements and planning of daily operations,
- plan, schedule, review workload and employees to being met on a cost-effective basis,
- work with ERP and MRP systems,
- risk management, warehouse management, supply chain synchronisation, strategic sourcing and purchasing, business strategy, change management and maintenance management
- standards (production area), process improvement, lean management and benchmarking.

KPI 5 is an efficiency indicator of production planning processes and sales/marketing management. This is an important metric and should be regularly evaluated, depending on the industry and finished goods. Inventory holding costs can be a substantial portion of operating/inventory costs and could reduce cash flow. The first group of competencies include e.g. logistics, shipping and warehousing management knowledge and skills, inventory system experience etc. The essential competences of KPI 5 are:

- distribution design, sourcing and management duties,
- schedule shipments and deliveries,
- maintain warehouse inventory, analyse product orders to research the need for keeping certain items in the warehouse, maintain sufficient inventory levels,
- plan the supply chain continuity,
- logistics — monitor the movement and storage of materials and products in coordination with suppliers, internal systems and customers, build a relationship with vendors,
- quality control of inventories, oversee and monitor the availability of stock to reduce shortages,
- manage daily schedules of inventory turns and deliveries of inventories,
- work with ERP and MRP systems,
- employ practices and procedures of warehousing, review inventory needs, support simplification and standardisation of processes to accelerate logistics efficiencies, suggest solutions for improvement, maintain logistic documentation,
- standards (warehousing), process improvement, lean management principles.

KPI 6 is essential for the ability of a business to reduce manufacturing costs, whether it is through adjustments to materials, labour or overheads. Comparisons between plants can give leaders insight into how to load them, whether to substitute raw materials and even renegotiate purchase contracts to reduce costs. KPI 7 can be calculated on several levels: on a company level, department level and even a production-line level. Revenue per employee shows the areas with the lowest and highest ROI. The first group of competencies includes e.g. knowledge of Generally Accepted Accounting Principles (including IFRS), reporting knowledge and skills, contracts law etc. It is

possible to generalise ten essential competences of these two KPIs:

- preparation of the company's financial statements,
- oversee month-end closing and year-end closing, coordinate and assign staff duties,
- evaluate departmental performance and make adjustments to daily operations when needed to ensure that the department meets overall objectives,
- provide guidance and direction to employees to ensure work is performed efficiently, timely and knowledgeably, use statistics and measure financial indicators related to employees,
- control contracts (financial aspects),
- cooperation with the sales department and operations department,
- financial forecasting and meetings with top management about budgeting and reviewing strategies to meet overall goals and objectives,
- work with ERP and MRP systems,
- risk management, financial management, business strategy,
- standards (accounting, taxes...), work closely with financial institutions and stakeholders.

KPI 8 is the calculation of a business unit or a company's earnings, prior to having any interest payments, tax, depreciation, and amortisation subtracted for any final accounting of income and expenses. EBITDA is typically used as a high-level indication of the current operating profit of a business. KPI 14 is the duration between the purchase of a manufacturing plant or a business unit's inventory, and the collection of payments/accounts receivable for the sale of products that utilise that inventory, typically measured in days. Abilities of the first group of these indicators are identical with the indicators KPI 6 and 7. Ten essential competences of these two KPIs can be generalised:

- preparation of the company's financial statements, reports and special analyses, be a business partner to the CEO,
- oversee month-end closing and year-end closing, coordinate and assigns duties to staff as needed, manage finance, accounting,
- manage and supervise financial accounting, tax and compliance departments with the overall responsibility for hiring and disciplining employees,
- timely, accurate analysis of budgets and financial reports, oversee completion of timely annual audited financial statements,
- provide strategic financial input and leadership on decision-making problems affecting the business,
- cooperation with the sales department and operations department, HR department (new, modified disconnect sales orders, problems...),
- forecast and improve the timeliness and accuracy of cash flows and manage the billing and collections process,
- work with ERP and MRP systems,
- risk management, financial management, business strategy, develop and advise on business development and strategic planning,
- standards (accounting, taxes...), work closely with financial institutions, customers, vendors, auditors and company owners.

KPI 9 has a similar structure as the OEE indicator, but the Overall Labour Effectiveness is divided into its constituent parts Utilisation (direct hours vs attendance hours), Performance (actual speed vs standard speed) and Quality (per cent labour hours lost to rework). The first group mainly consists of knowledge and experience from the field of HRM. Ten competences of the KPI 9 are:

- implement HR programs, identify opportunities for improvement, manage the work related to HR reporting, develop and monitor an annual budget,
- establish HR departmental measurement that supports the accomplishment of the company's strategic goals, prepare periodic reports,
- evaluate departmental performance and adjust daily operations when needed to ensure the department meets overall goals and objectives,
- provide guidance and direction to employees to ensure work is performed,
- coordinate all HR training programs, the implementation of the performance management system including performance development plans,
- cooperate with other departments,
- establish the standard recruiting and hiring practices and procedures, formulate HR policies and objectives,
- work with ERP and MRP systems, manage, develop and maintain human resources information system (employee Intranet...),
- HR management, business strategy, coach and train managers and employees, keep track of the HR legislation,
- manage the process of organisational planning that evaluates structure, job design and person-

nel forecasting, evaluate plans and change plans, deal with conflicts between employees.

KPI 10 is a quality measure, which reflects the number of completed units rejected or returned by external customers expressed in parts per million. Calculations should include parts reworked by customers. The KPI 13 Customer Satisfaction Index is a universal analytic tool designated for measuring customer satisfaction with a product, service or a company as a whole. It helps to explain the reasons behind a customer's satisfaction or dissatisfaction. The first group of competencies includes CRM knowledge, customer service principles, proficiency in CRM systems etc. Ten essential competences of these two KPIs are:

- develop and implement customer service policies and procedures, define and communicate customer service standards,
- review and assess customer service contracts,
- ensure the necessary resource and tools are available for high-quality customer service delivery,
- review customer complaints, track customer complaint resolution,
- handle complex and escalated customer service issues,
- cooperate with other departments,
- monitor accuracy of reporting and database information, analyse relevant data to determine customer service outputs,
- work with ERP and MRP systems, manage, develop and maintain the information system (employee Intranet, newsletters...),
- maintain CRM Business strategy, keep track of the contracts law, maintain the CRM database, identify and improve quality of service, productivity and profitability,
- co-ordinate and manage customer service project and initiatives.

The KPI 11 is considered as one of the few important Six Sigma metrics. It is the ratio of the number of defects (flaws) in one million opportunities when an item can contain more than one defect. KPI 12 is essential because the quality of materials usually determines the quality of the end products. If the quality of the materials supplied is low, the expenditure for product repairs increases. In an ideal situation, this means an extra cost to the manufacturer. Employers and people in charge have to report incidents — KPI 15. Casualties and life-threatening injuries, such as amputations, have to be reported immediately. Other serious incidents should be reported as soon as the employer has been made aware of the incident. Ten essential competences of these three KPIs can be generalised:

- ensure that the QMS conforms to requirements of the customers, internal procedures, ISO norms and regulators,
- ensure evaluation of and reporting on quality systems,
- manage the monitoring, measurement, review of internal processes, especially those that affect the quality of the product,
- lead a team of quality engineers, inspectors, auditors, analysts, technicians,
- work with customers, employees, contractors, outsourcing companies to develop product requirements, deal with related problems,
- cooperation with other departments, analysis of suppliers, a database of suppliers, assessment of suppliers (material quality, corrective action), + improvements,
- work with ERP and MRP systems, manage, develop and maintain the information system (employee Intranet, newsletters...),
- manage quality, perform root cause analysis and resolve problems,
- monitor the completion of tasks and ensure good performance and record on appropriate systems.

The first group of abilities includes e.g. QMS knowledge and skills, manufacturing and environment management knowledge and skills, experience in Quality Assurance, Lean Manufacturing and skills/knowledge in mathematics and statistics.

Conclusions

In conclusion, we state that the Z-MESOT matrix was used to identify a consistency rate of the selected measurement systems and performance evaluation systems while defining fundamental attributes of indicators and determining responsibility as a key element of competences. Mainly top managers are held directly responsible for defining an indicator. Providing that it is only an operational level of performance and the indicator does not measure a strategic target, it can also be defined by shareholders of the processes or service level management.

Responsibility for defining a target value referred to as T1 (Fig. 1) is closely linked to responsibility for defining an indicator (F5). The general rule says that a person defining an indicator also defines its target value. The target value is important from a point of view of performance evaluation and its determina-

tion should therefore be delegated to a specific employee. The responsibility for measuring and recording continuous values of indicators (referred to as I1 in Tab. 1) is defined by an employee in charge, who records values within a defined timeframe and at a particular place. The responsibility for the assessment of an indicator (referred to as E1 in Tab. 1) is connected with the attribute T1, i.e. a manager is directly responsible for his/her indicators.

Based on a random selection of large businesses and the obtained results, it may be stated that a person defining an indicator and determining its target value is finally responsible for the evaluation. These responsibilities are not clearly defined in medium-sized businesses or divided among various work positions giving rise to possible conflicts in the workplace. In critical situations, a competent person is required to undertake delegated powers, thus transferring the burden from one work position into another. An explicit definition of specific attributes of particular indicators by means of the Z-MESOT method can help eliminate problems resulting in incorrectly defined responsibilities and powers in the course of measurement and performance evaluation processes.

Performance and measurement responsibilities were explicitly defined in most key performance indicators. Managers positively evaluated a combination of suggested indicators that cover key business performance areas. Competent managers express their opinion that measuring and evaluating performance for them is a necessary tool for successful corporate governance. Overall, the Z-MESOT method positively evaluates the analysed companies. It is not only a useful tool for identifying consistency, but also an instrument that considers methods to represent new enterprise-style management based on the integration of all levels of enterprise performance. For most of the analysed businesses, the performance of an enterprise was an important part of integrated management systems in the practical context.

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Influence of personal variables on entrepreneurial intention: a comparative study between Poland and Spain

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ABSTRACT

This article analyses the influence of personal variables on entrepreneurial intentions of students from Poland and Spain. The article presents an integrated structural model that has been developed from a set of student perceptions from both countries. A small number of variables included in the model allows explaining and managing the formation of the intention in the context of higher education. This study provides answers to the following questions: What role do personal variables play as motivation in the formation of entrepreneurship in the case of young people? Is the motivation stronger than self-efficacy? What are the differences in the perceptions and ratings of students in Poland and Spain? How can these variables be enhanced? This work used a causal quantitative methodology based on structural equations (PLS) and the Smart PLS-3.0 program. The PLS model was chosen for its advantages in the study of human behaviour and its optimal predictive potential, and because it allows the use of reflective indicators. In the causal model generated with a sample of 721 respondents from Poland and Spain, it was found that personal values initiated the chain of effects that influenced the attitude and, through it, successively resulted in motivation, self-efficacy and entrepreneurial intentions. Therefore, the subjective variables (values and attitudes) have a positive and significant influence on the action variables (motivation and self-efficacy), and these affect entrepreneurial intentions. The absence of significant regional differences in the responses to the items and the causal relationships of the model suggests the possibility of developing integrated and homogeneous programmes for the entire segment, thereby achieving synergies. The results suppose a theoretical and practical contribution to the promotion of entrepreneur intentions of university students inside and outside the educational context, suggesting a possible effect of personal variables on entrepreneurial intentions.

KEY WORDS

entrepreneurial intention (EI), self-efficacy, motivation, enterprising attitude, value

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Introduction

The literature confirms the need to identify and strengthen the factors, on which the process of creating new companies depends, due to the high influence that entrepreneurship has on the economic growth and development of countries (Urbano, Aparicio & Audretsch, 2018). In the studies developed by researchers and the reports and documents prepared periodically by the GEM (Global Entrepreneurship Monitor), it is confirmed that these factors are eminently contextual and personal (Busenitz et al., 2014). Although the contextual factors of entrepreneurship

are important, the human capital approach predominates in the literature, according to which the entrepreneur is the key to success in the process of creating a new company (Fuller et al., 2018). It is the entrepreneur who must be enthusiastic and put some effort into creating a new company, thereby obtaining intrinsic (autonomy, personal satisfaction) and extrinsic (economic) benefits (Werthes et al., 2018).

The studies of entrepreneurs have been largely descriptive and have focused on specifying their role and identifying their most important attributes, generally analysed through their perceptions (Mottiar et al., 2018). Among the entrepreneurial attributes, intention — the variable that best predicts entrepreneurial behaviour — has special relevance in the literature (Lee & Wong, 2004; Salhi, 2018). The study of entrepreneurial intentions was aimed at the development of causal models, such as the Shapero and Sokol model (1982) of the entrepreneurial event and the planned behaviour model by Ajzen (1987, 1991). The models are the two most extensively tested competing theories that have been used to explain entrepreneurial intention. Intention-based models are implemented successfully not only in social psychology but also in marketing and management (Wach & Wojciechowski, 2016). The models have received some criticism, and several authors have emphasised the importance of further clarifying the role played by certain personal variables, such as motivation, without including contextual variables (Hien & Cho, 2018).

In the study of the personal factors responsible for entrepreneurship, comparative studies at a regional level have also become very important (Acs, Autio & Szerb, 2014). In the development of this perspective, it has been considered that globalisation and the revolution of ICT have altered the meaning of entrepreneurship within the framework of national borders and have homogenised the cognitive and behavioural patterns related to the process of creating a new company (Udretsch et al., 2017). According to the studies, regional differences in entrepreneurship are mainly related to personal variables that can lead to variations in the quantity and quality of entrepreneurship (Trettin & Welter, 2011). Despite these findings, is the literature recognises the necessity to study the entrepreneur at a regional level in greater depth (Hong et al., 2015). Particularly relevant is the homogenisation of cognitive and behavioural patterns in the case of younger generations, as is the case of the so-called Generation Y or Millennials. In their analyses, Yusof et al. (2007) and Nabi et al. (2010) highlighted the interest in the quantitative importance and the role of the generational change in the current generations of entrepreneurs. Should these homogenisation processes be confirmed, it could allow adopting educational and institutional measures to promote homogenous and global entrepreneurship in that particular population segment (Charters et al., 2011; Stuetzer et al., 2016).

The literature also provides evidence of the need to study entrepreneurial intention among university students, since most countries consider entrepreneurship a labour option, which is increasingly valued by this segment (Oftedal et al., 2018). It has also been verified that education allows distinguishing people who become entrepreneurs from those who do not (Tsordia & Papadimitriou, 2015). Finally, as entrepreneurs are made rather than born, the role of education in the learning of entrepreneurship and the development of the personal variables, on which this process depends, seems evident, as is the case of values, motivation and self-efficiency (Nabi et al., 2018).

To address the concerns and suggestions found in the literature, this comparative study, dedicated to entrepreneurial intentions of university students in Poland and Spain, has been deepened within the framework of the human capital approach. The two countries have been chosen because, although both are members of the EU, Poland was part of a different social and geopolitical context until two decades ago and has started a process similar to that developed by Spain in the eighties of the last century. Entrepreneurship has been studied in Poland and Spain considering contextual but not personal variables (Morinao et al., 2011). Although these are two socio-cultural and institutional contexts that a priori show great differences with respect to entrepreneurship, the prevalence of a homogenising generational approach of cognitive and behavioural patterns is assumed in this work. For this reason, the authors present an integrated structural model that has been developed using a set of perceptions of young students from Poland and Spain. The small number of variables included in the model allows explaining and managing the formation of the intention in the context of higher education. This study provides answers to the following questions: What role do personal variables play as motivation in the formation of entrepreneurship in the case of young people? Is the motivation stronger than self-efficacy? What are the differences in the perceptions and ratings of students in Poland and Spain? How can these variables be enhanced? Regarding the structure of the work, the analysis of

the intent and the hypotheses associated with the proposed model are addressed first, followed by results, discussion, conclusions and implications of the study.

1. Literature review and hypotheses

The entrepreneurial intention is a measure of the will and effort that the entrepreneur is willing to make to create a company (Fuller et al., 2018). It is a variable that best predicts entrepreneurial behaviour, as was shown in the review work of 409 articles on entrepreneurship carried out by Liñán and Fayolle (2015). Previous work has shown that intention depends above all on personal factors. This relationship is especially evident in the explanatory causal models of intention (Elfving, Brännback & Carsrud, 2009). The best-known models of the intention to undertake training are the planned behaviour model (Ajzen, 1987, 1991) and the entrepreneurial event model by Shapero and Sokol (1982).

In the Shapero and Sokol model, the intention is formed based on perceived desirability, viability and the propensity to act (Krueger et al., 2000). For its part, the theory of planned behaviour argues that the intention to create a company depends on the influence of three variables: the attitude towards behaviour, the perceived behavioural control and the subjective norm, with attitude being the initial variable of the chain of direct and indirect effects that lead to intention (Ajzen & Fishbein, 2005; Ajzen & Cote, 2008). The attitude in this second model is equivalent to the perceived desirability included in the first model, and behavioural control is a form of perceived viability, included in the model by Shapero and Sokol (1982). In the second model, Ajzen adds the subjective norm, which also influences entrepreneurial intention. Both models have been empirically contrasted and provide satisfactory predictions of intention. However, both the entrepreneurial event model and the planned behaviour model have received methodological criticism and many authors believe that efforts should be made to incorporate new personal variables and new relationships into the models (i.e. Autio & Acs, 2010).

As already noted, explanatory models of intention consider attitude as a personal variable in the initial succession of effects that lead to entrepreneurial intention. However, to address the suggestions of other authors in this study, values were included as a personal variable antecedent to the attitude that constitutes the link between contextual variables and personal variables. Although the literature accepts that companies are created voluntarily and intentionally (Bullough et al., 2014), it is the process of socialisation which, to a large extent, makes possible the unconscious internalisation of the values that will ultimately lead to the development of attitudes favourable to entrepreneurship, on which the entrepreneurial behaviour will depend (Lanero et al., 2014; Hui-Chen et al., 2014). The values are at the origin of any behaviour, in addition to having high stability and, to a large extent, determined by the shared culture predominant in society (Jahanshahi et al., 2017). Considering the above, the first hypothesis was established:

Hypothesis 1: Values have a direct and positive influence on the entrepreneurial attitude

Attitudes are closely related to the favourable predisposition of a person towards an object or behaviour, in this case, the behaviour of creating a company (Ajzen & Fishbein, 2005; Tomczyk, Lee & Winslow, 2013). In the models that explain the formation of entrepreneurial intention, attitudes influence the intention and behaviour through other mediating variables, such as motivation and self-efficacy (Wyrwich, 2015). Specifically, in the educational context, it has been proven that the motivation to start a business and the perceived self-efficacy are effectively influenced by attitudes of students towards entrepreneurship, and the attitude can explain 50% of the variance (Schwarz et al., 2009; Lheureux & Auzoult, 2017). Hence, the following hypothesis:

Hypothesis 2: The attitude towards entrepreneurship directly and positively influences the entrepreneurial motivation

Motivation is considered a fundamental variable in the process of creating a company and is a factor with sufficient explanatory potential for entrepreneurial intention (Chen et al., 2017; Mahto & McDowell, 2018). The reasons that motivate entrepreneurs to create a company are diverse, and all of them are classifiable as internal or external (Kirkwood, 2009). The external factors of motivation include the desire to increase income or obtain social status, and among them all, the need for achievement and the desire for independence and autonomy stand out (Fayolle & Liñán, 2014). Extrinsic motivation is associated with "pull" factors, which invite the subject to become an entrepreneur, and is particularly related to entrepreneurial intention, which in turn influences

behaviour (Fayolle, Liñán & Moriano, 2014). The internal motivation is related to "push" factors, which push the person to become an entrepreneur, and is associated with perceived self-efficacy. Self-efficacy is defined as the perception or belief of the subject in its own capacity to achieve a positive result (Kirkwood, 2009). Given the above, it seems understandable to accept that individuals feel more self-reliant when they possess a high intrinsic motivation to perform the behaviour (Tsai, Chang & Peng, 2016). Therefore, the third hypothesis dictates that:

Hypothesis 3: The motivation that pushes a person to become an entrepreneur has a positive and direct influence on self-efficacy.

Self-efficacy is one of the essential attributes of a potential entrepreneur and the main antecedent of intention (Fuller et al., 2018). This may be because self-efficacy entails certain levels of personal competence that are linked to the perception of control in the face of behaviours that assume a certain risk, as in the case of entrepreneurship (Cho & Lee, 2015). The perception of self-efficacy involves evaluation of confidence of an individual regarding certain internal (personality) and external (environment) aspects that can be limiting or facilitating the behaviour (Byrant, 2007). Additionally, self-efficacy influences the establishment of goals, the expectations of results as well as the amount of effort the entrepreneur devotes to start up the company, despite the presence of other alternatives, and perseverance in the face of difficulties and challenges (Zhao et al., 2005; Trevelyan, 2011). Previous research has shown a significant and positive relationship, both direct and indirect, between self-efficacy and intention (Akmaliah, Pihie & Bagheri, 2013), also in the case of university students (Carr & Sequeira, 2007). This gave rise to the following hypothesis:

Hypothesis 4: Self-efficacy has a positive and direct influence on entrepreneurial intention

Considering the hypotheses, the proposed model is as follows (Fig. 1). This model is characterised and differentiated from other models by its simplistic, equable and practical a, and exclusively personal variables. Unlike other models, the model starts with the personal values of the respondent, and introduces motivation.

One might think that the causal relationships associated with the previous hypotheses could be different depending on a country that studied in this work, that is, Poland or Spain. However, in this study, we have been assuming the greater homogenising weight of a generational approach in a context of globalisation in the face of the differentiating effect that the contextual variables of each country could exert (Nowak, Tach & Olsen, 2006). Therefore, starting from the premise that young people of the Generation Y share perceptions, values and attitudes (Charters et al., 2011), which has led in this work the joint study of the samples of young people from Poland and Spain, the fifth hypothesis is proposed:

Hypothesis 5: There are no significant differences in the perceptions about entrepreneurship between young people in Poland and Spain (responses to the items), nor in the causal relationships of the proposed causal model.

2. Research methods

This work used a causal quantitative methodology based on structural equations (PLS) and the SmartPLS-3.0 program. The PLS model was chosen for its advantages in the study of human behaviour, for its optimal predictive potential and because it allows the use of reflective indicators (Hair et al., 2011). Discriminant analysis has also been used in a descriptive methodological context.

2.1. Sample and data collection

The sample was composed of young university students from Poland and Spain, attending to the suggestions of other authors regarding the importance of higher education in entrepreneurship and

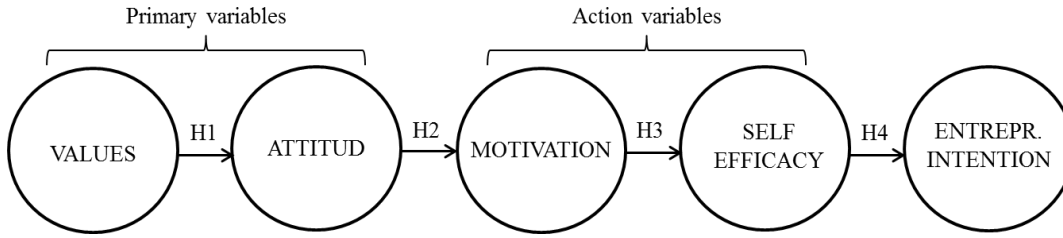

Fig. 1. Theoretical model

the need to study this population segment in greater depth (Bergmann, Hundt & Stenberg, 2016). Numerous authors noted that university students constituted a segment of interest for the study of entrepreneurship in general and the entrepreneurship intention in particular (i.e. Nabi et al., 2018; Oftedal et al., 2018).

The sample was intentionally chosen (Pina-Stranger et al., 2013) to be made of students from faculties related to business training since in this context, it is easier to approach and promote entrepreneurship. However, to administer the questionnaire, the days and times were chosen randomly among those with the greatest attendance of the students to the classrooms, so that the number of students in the sample of each of the courses was representative of the one that exists in the degree. The research was conducted in the first quarter of 2019.

Table 1 presents the data of the sample, formed of 721 respondents. The initial sample included 23 respondents who were excluded because they left items unanswered, or they gave all the items the same score. The size of the sample and that of the subsamples meets the minimum rule of being 10 times greater than the number of variables observed (items) in quantitative studies when the questionnaire is used (Nunnally, 1978). It is also superior to 200 respondents, an adequate size when structural equations are used (Hair et al., 2011). For a more precise assessment, the effect size (0.15), the indicator α (0.05) and the power (power) (0.95) were specified with a total of 10 observed predictor variables (items) (Cohen, 1988; Chin & Newsted, 1999; Buchner & Lang, 2009). Regarding age, 97% of the respondents were between 18 and 23 years old.

Tab. 1. Description of the sample

Gender	Country		Total
	Spain	Poland	
Male	144	175	319 (44.24%)
Female	195	207	402 (55.76%)
Total	**339 (47.02%)**	**382 (52.98%)**	**N=721**

2.2. Measures and the instrument

In this work, the questionnaire was used to collect the information, as it is usual in this type of study. To ensure the validity of content in the design of the questionnaire, a group of two experts from Poland and Spain and eleven students (6 from Spain) analysed the literature to identify the variables to be observed (items) and possible relationships (Roy, Dewit & Aubert, 2001). The Delphi technique was used in two rounds to construct the basic relationship of the contents to be measured by the items (Chan et al., 2001; Morris et al., 2013).

The items corresponding to entrepreneurship intention, attitude and self-efficacy were designed according to the contributions of Liñán and Chen (2009) and Muhammad, Aliyu and Ahmed (2015). For the design of the items related to motivation, the suggestions of Antonioli et al. (2016) on intrinsic and extrinsic motivation were accepted. Following a pretest, the final questionnaire was left with 10 items (Tab. 2), following the principles of brevity and simplicity, thereby reducing the costs and methodological problems associated with the use of a large number of indicators (Bergkvist & Rossiter, 2007). A Likert scale with five response alternatives (from 1: strongly disagree, up to 5: strongly agree) was used.

3. Results

To identify the latent variables, to which the items belong, an exploratory factorial analysis with varimax rotation was first carried out, using the principal component method (Anderson & Gerbing, 1988). After a series of analyses, a structure of five latent variables or factors was obtained, each with two items (Tab. 2). The inclusion of only two items per factor was accepted because the variables that make the factors have a high correlation with each other (greater than 0.70) and a reduced correlation with other variables (Yoo & Donth, 2001; Worthington & Whittaker, 2006; Yong & Pearce, 2013). The factors or latent variables of the model are values (VA), attitude (AT), motivation (MO), self-efficacy (SE), and entrepreneurial intention (EI).

Next, the values were obtained for each one of the observed variables (items). It is noteworthy that in Table 2, the items most valued by young people were those related to attitude and motivation. On the contrary, the least valued items were those related to entrepreneurial intention, although they obtained values higher than 50% of the maximum value that the item could have obtained if all the subjects had given it a value of five.

Regarding the causal analysis of the proposed model, the measurement model was first evaluated, which relates the observable variables and their latent variable, and, subsequently, the structural model, which relates some latent variables with others (Thai & Turkina, 2014). The analysis of the measurement

Tab. 2. Valuations, Load (λ), compound reliability (FC) and average extracted variance (AVE)

Variable	Item	[%]	Load λ	FC	AVE
VA	VA1: I value entrepreneurship as an alternative to employment	76.70	0.867	0.844	0.730
	VA2: I value entrepreneurship because it allows growth	77.98	0.842		
AT	AT1: Entrepreneurship has more advantages than disadvantages	78.36	0.806	0.794	0.659
	AT2: I am in favour of entrepreneurship and the creation of companies	89.68	0.817		
MO	MO1: I would be motivated to be an entrepreneur	82.66	0.916	0.888	0.798
	MO2: It would motivate me to be an entrepreneur to achieve autonomy	80.64	0.870		
SE	SE1: I think I would succeed if I created a company	73.43	0.881	0.897	0.813
	SE2: I have confidence in myself to start a business	74.92	0.922		
EI	EI1: I intend to be an entrepreneur	68.88	0.946	0.942	0.890
	EI2: In the future, I think I have my own company	72.12	0.942		

VA: values, AT: attitude, MO: motivation, SE: self-efficiency, EI: entrepreneurial intention

Tab. 3. Discriminant validity (Fornell and Larcker criteria)

	VA	AT	MO	SE	EI
VA	**0.855**				
AT	0.447	**0.812**			
MO	0.431	0.445	**0.893**		
SE	0.257	0.384	0.512	**0.902**	
EI	0.265	0.331	0.540	0.688	**0.944**

Tab. 4. Direct relationships and their significance (β)

Hypothesis	(B)	T	P	Confirm.
H1: VA → AT	0.447	14.388	0.000	Yes
H2: AT →MO	0.445	12.515	0.000	Yes
H3: MO → SE	0.512	17.973	0.000	Yes
H4: SE → EI	0.688	37.114	0.000	Yes

model involved studying the reliability and validity of the relationships between the observed variables (items) and the latent variables to which they were associated. Regarding the individual reliability of the item, the simple correlations of the indicators with the construct they intend to measure were analysed, showing that the observed variables reached the minimum required load level ($\lambda \geq 0.70$) (Tab. 3). Therefore, it was accepted that the indicators were part of their corresponding constructs.

Regarding the study of the composite reliability (CR), an indicator similar to Cronbach's alpha is more recommendable in the context of structural equations, all the values have been above 0.70, for which it is verified that the model of the measure is internally consistent and all indicators or variables observed measure their corresponding latent variable (Bagozzi & Yi, 1988; Hair et al., 2014).

Convergent validity and discriminant validity were also analysed. To evaluate the convergent validity of the model, the average extracted variance (AVE) was calculated. In all cases, the result was higher than 0.50, so it was found that more than 50% of the variance of the construct was due to its indicators (Chin, 2010) (Tab. 3). Regarding the discriminant validity, it was found that each construct was significantly different from the others and was not related to them according to the theory. In this sense and following Fornell and Larcker (1981), it was found that the square root of the variance extracted (AVE) (in the diagonal of Tab. 3) was greater than the variance shared between the construct and the other constructs of the model (Chin, 2010).

Regarding the evaluation of the structural model, it was found that the exogenous latent variables contributed to the explanation of the variance of the endogenous latent variable (EI) in a significant way, since the path coefficients (β) (standardised regres-

Tab. 5. Indicators R2, Q2 and GoF

	R^2	AVE	Q^2
AT	0.200	0.659	0,124
MO	0.198	0.798	0,148
SE	0.263	0.813	0,201
EI	0.473	0.890	0,396
Media	0.284	0.790	
GoF	**0.474**		

Tab. 6. Discriminant analysis. Basic indicators

Auto-value	Canonical Correlation	Lambda Wilks	Sig.	Centroids	
				Spain	Poland
0.918	0.692	0.521	0.000	-1.015	0.901

Tab. 7. Discriminant analysis. Standardised coefficients (SC)

Construct	Items	SC
VA	VA1	0.051
	VA2	-0.186
AT	AT1	0.124
	AT2	-0.174
MO	MO1	0.218
	MO2	0.277
SE	SE1	-0.091
	SE2	0.097
EI	EI1	-0.817
	EI2	-0.205

Tab. 8. PLS-GMA Analysis

Hypothesis	Spain Path (β)	Poland Path (β)	Dif. Path (β)	P Values
H1: VA → AT	0.453	0.436	0.017	0.388
H2: AT →MO	0.475	0.421	0.054	0.229
H3: MO → SE	0.495	0.457	0.038	0.278
H4: SE → EI	0.703	0.641	0.062	0.054

sion weights) reached levels above the optimal level ($\beta \geq 0.3$) (Sarstedt et al., 2014) (Tab. 4). All the direct causal relationships obtained a high significance ($P \leq 0.01$), as was revealed in the bootstrapping analysis with 500 sub-samples and 200 cases (Lanero et al., 2014). Therefore, all the hypotheses of the proposed model are confirmed.

The values towards entrepreneurship initiate the chain of effects that lead to the intention of creating a company in the segment studied. The relationships with greater weight (Tab. 4) occur between perceived self-efficacy (SE) and entrepreneurial intention (EI) (H4: $\beta = 0.688$), and between motivation (MO) and self-efficacy (SE) (H3) : $\beta = 0.512$).

In the study of the structural model, three additional indicators were calculated (Tab. 5): (i) indicator R2, which reports on the amount of variance explained by the model in each dependent latent variable; (ii) indicator Q2, developed by Stone (1974) and Geisser (1975) to measure the predictive relevance of dependent constructs; and (iii) the GoF (Goodness-of-Fit) test, which represents the geometric mean between the average of the AVE indicator and the average of R2 in relation to the endogenous constructs (Wetzels, Odekerken-Schröder & van Oppen, 2009). It was verified that the latent variables explained sufficient variance of the consequent variables, since the basic indicator R2 reached the minimum level of 0.1 proposed by Falk and Miller (1992) ($R2 > 0.1$). On the other hand, the values above zero of indicator Q2 ($Q2 \geq 0$) allowed verifying the predictive relevance of the model (Riquel & Vargas, 2013). Finally, a GoF value of 0.474 was obtained, which is higher than the minimum acceptable value (GoF = 0.25) (Wetzels, Odekerken-Schröder & van Oppen, 2009) (Tab. 5). Consequently, the model has predictive potential.

To contrast the fifth hypothesis (H5), a discriminant analysis was carried out first, to identify differences in the responses to the items by the Polish and Spanish students. The levels of the eigenvalue, the canonical correlation and the Lambda indicator (Tab. 6) suggest some significant difference.

The results of Tables 6 and 7 indicate that the only significant difference in the answers to the items by the students of Spain and Poland is the one related to the item EI1 ("I intend to be an entrepreneur"). The value for this item of the standardised coefficient (EC = -0.817) indicates that Spanish students have greater intention than Poles.

To analyse the differences in the causal relationships of the model between Spain and Portugal, a multigroup PLS-GMA analysis was carried out (Hair et al., 2014). The results obtained using 5,000 cases show that, considering the differences path $p \leq 0.05$ and $d\ p \geq 0.95$ are considered significant, there is no significant difference between Spain and Poland in the causal relationships of the proposed model.

4. Discussion

It has been noted in the review of the literature that universities are a potential source of future entrepreneurs, and that creation of a company is a job option increasingly valued by university students of any country (Tsordia & Papadimitriou, 2015). However, student assessments of their self-efficacy and entrepreneurial intention could be higher, without contradicting the previous statement. This may be because together with the third and fourth year students, who are the closest to making labour decisions, respondents belonging to the first and second years of their degree were included in the sample, even though they have more time to finish their studies without a pressing need to think of work alternatives. On the other hand, the sample was formed by a similar percentage of women and men, having in mind that women are often characterised as having a lower entrepreneurial intention (García & Welter, 2013), lower perceived self-efficacy (Fielden et al., 2003) and lower declared confidence (Maes et al., 2014).

The generated causal model allows adequately explaining the formation of entrepreneurial intention using a small number of personal variables and without contextual variables. Some of the personal variables of the model were studied by other authors (i.e. subjective norm, self-efficacy) (Shapero & Sokol, 1982), yet others were not (i.e. motivation) (Autio & Acs, 2010). As in the explanatory models of the entrepreneurial intention developed by other authors, this study had values and attitudes of students, i.e. the variables that initiate the chain of direct and indirect causal effects that culminate in entrepreneurial intention (Ajzen & Cote, 2008). Therefore, the most internal "subjective" variables (values and attitudes) influence the variables associated with undertaken action (motivation and self-efficacy), and these affect entrepreneurial intention.

In response to the suggestions of other authors, the proposed model was provided by values that were included as a personal variable antecedent to attitude. It has been found that the values were at the origin of the entrepreneurial behaviour, firstly influencing the attitudes and then — the other personal variables (Jahanshahi et al., 2017). In the same way, it has been shown that in the educational context, attitudes influence the intention and behaviour directly through motivation and indirectly through self-efficacy (Wyrwich, 2015; Lheureux & Auzoult, 2017). The direct and positive influence of the motivation on self-efficacy and indirect on the entrepreneurship intention (García et al., 2016) confirmed that in the case of university students, "push" factors plaid an important role (Charles & Gherman, 2013). Additionally, the study found that the perception of self-efficacy positively and directly influenced the entrepreneurial intention of university students, as stated in other studies (Carr & Sequeira, 2007). This may be because the perception of self-efficacy includes a positive evaluation of the student confidence in the risk associated with certain internal and external factors of an enterprise (Cho & Lee, 2015).

The reduced significance associated with the differences found by country in the responses to the items and in the causal relationships of the model confirmed the premise that has been assumed in this study regarding the greater homogenising weight of the generational approach to the differentiating effect of the contextual variables of each country (Nowak, Tach & Olsen, 2006). Therefore, it is confirmed that regarding the variables included in this study, young students from Spain and Poland share perceptions, values and attitudes about entrepreneurship (Charters et al., 2011). The greater intention of Spanish students compared to the Poles can be explained by the weight of certain contextual factors linked to the existing entrepreneurship in both countries, which could include aspects such as tradition and entrepreneurial history, the existing norms, infrastructure and bureaucracy, and even issues related to religion.

Conclusions

The study responded to concerns of other authors regarding the need to study in greater depth and learn more about ideas and perceptions of university students regarding entrepreneurship in a regional comparative context. As previously confirmed, personal variables alone could determine entrepreneurial intention, this study could help promote the necessary attributes in the educational context, that is, motivation, self-efficacy and intention, among other

personal variables. In this sense, the study found that to carry out this task, a good attitude and disposition on the part of students is required, as suggested by evaluations given by students of both countries.

A training model was generated to promote entrepreneurial intention. It is statistically significant, fair and applicable at universities because the included variables were developed throughout all educational levels, including higher education. The logic of the proposed model allows to better understand the sequence of the process for the formation of entrepreneurial intention in the segment of university students, considering personal variables alone. This process begins with values, followed by attitudes, motivation, self-efficacy and intention. Therefore, the model moves from more subjective variables to variables of efficacy and personal action. The most abstract variables (values and attitudes) were those that influence the variables closest to the entrepreneurial behaviour: motivation, self-efficacy and intention. These results should also be considered in the teaching and learning process.

The social and subjective nature of personal variables included in the model allows concluding that although entrepreneurship is a conscious, intentional and voluntary process, the creation of companies is not exempt from conditions particular to every entrepreneur depending on the history of modelling and reinforcements received during the development. These aspects allow concluding that higher education must know the conditions that affect students regarding self-efficacy, motivation and intention, to change those that are unfavourable and enhance the favourable. This mission is transferable to the entire educational process since birth. Besides, at the age a person can effectively create a company, never before the age of 18, the development is finished.

The absence of significant differences according to the country of origin in the responses to the items and the causal relationships of the proposed model allow confirming the weight that globalisation and the development of ICT, among other factors, have on homogenisation in a comparative context of regional cognitive and behavioural patterns associated with entrepreneurship. This makes it possible to carry out more standardised and homogeneous interregional programmes associated with the teaching and learning process that affects the variables included in this study. This would achieve synergies.

The limitations of this study are associated with the inherent difficulty of standardised design and application of an adequate instrument to study perceptions about personal variables in populations of such different countries. The collaboration provided by the agents that have developed their activity in the two countries has facilitated this work. In the future, it is suggested to extend the model with contextual variables and carry out comparative studies focused on well-differentiated countries.

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Benchmarking of contributory organisations within the framework of technical efficiency

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ABSTRACT

Organisations should evaluate their goals in the areas of customer service provision, overall organisational strategy, finance, and human resource management. The performance of specific services provided to the client should be monitored and evaluated in greater detail. The comparison should be made between similar organisations aiming to improve services and technical efficiency. Most organisations, profit and non-profit alike, do not know how to evaluate and compare their efficiency. Retirement homes were selected for evaluation. The review focused on the technical efficiency for the years 2015-2017. To achieve the goal, Data Envelopment Analysis (DEA) was used as a specialised model tool for assessing the technical efficiency, performance or productivity of a group of homogeneous or comparable production units based on selected inputs and outputs. Due to different types of inputs and outputs, the method was selected from among multi-criteria decision-making methods. Two models, Model X and Model Y, including specific inputs and outputs, were designed to evaluate and compare the technical efficiency of selected retirement homes. According to the results, the output-oriented model (Model Y) was more effective for retirement homes compared to the input-oriented model (Model X). The value added could be seen in the model combination and comparison between different studies, which helps to understand the transferability of the results. The analysis confirmed the necessity to combine the DEA method with the quality of service assessment to be able to benchmark the real efficiency of service of a selected type of an organisation.

KEY WORDS

contributory organisations, technical efficiency, Data Envelopment Analysis, comparable units

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Introduction

Performance measurement and management are important for both profit and non-profit organisations. Performance should be monitored by non-profit organisations in contexts of the provision of public services, employee appraisals, subsidies, and donor commitments. Typical areas that should be targeted evaluating the performance of a non-profit organisation are cost per client and per service provided, number of hours devoted to one client, number of clients per day, proportion of complaints in the total number of clients, cash-flow, number of bed-

hours and client-hours, client satisfaction rates, number of employees and their attendance, occupancy rate of facilities. According to Malíková (2011), several methods and techniques can be used to measure the quality and efficiency of social services such as quality standards of social services; supervision, intervision; TQM (Total Quality Management); ABC (Activity Based Costing), Balanced Scorecard; controlling; benchmarking; complaints; self-assessment and others. The methods range from simple metrics to complex metrics such as Balanced Scorecard. This is a system of performance management and measurement of an organisation, which is based on the establishment of a balanced system of interrelated performance indicators for a particular enterprise. The main characteristic of the Balanced Scorecard model is that it formulates the relationships between inputs, processes and results and focuses on the importance of managing these elements to achieve strategic priorities of an organisation.

In performance measurement of profit and non-profit organisations, most frequently encountered problems relate to low awareness of performance measurement methods and techniques, fragmented and inconsistent data, and insufficient usability of performance indicators, especially in contributory and non-profit organisations, where it is impossible to compare their technical efficiency (Mook, 2014; Moullin, 2017; Lepir et al., 2017; Meyer, 2018). The problem of assessing the performance of a contributory organisation may also be related to a one-year service financing system. This period may be too short for strategic planning or service development, and many measures might fail to manifest within one year. At the same time, there may be uncertainty about the future scope of such organisations and the range of provided services. The 4E (Economy, Efficiency, Effectiveness, Equity) input-output model is preferred not only for healthcare but also in social care services to support the efficiency and cost reduction (Vaňková & Vrabková, 2014; Dooren, Bouckaert & Halligan, 2010). According to the authors, it is possible to define technical and allocative efficiency of organisations, when technical efficiency is concerned with output maximisation and input minimisation, and, frequently, a mathematical model is used for performance evaluation. By contrast, allocation efficiency deals with cost-effectiveness, and the main point is to find the best combination of costs and maximum output in service units. Such models are based on cost analyses.

The main goal of this paper is to evaluate the technical efficiency of contributory organisations operating in the Czech Republic. Six retirement homes were included in the performance analysis. Individual retirement homes were denoted by abbreviations HE1 – HE6. The analysis was realised over the period 2015-2017 as a case study. The main interests of beneficiaries (residents of the retirement homes) reflected in the need for high quality and accessible services.

1. Literature review

Performance measurement defines information or feedback on actions taken to achieve strategic objectives and client satisfaction. Generally, the performance evaluation of a service provider is a time-consuming, complicated process and should include client satisfaction (Zemke et al., 2018). In general, performance can be defined according to Wagner (2009, p. 17) as "a characteristic which describes how the examined subject performs certain activity on the basis of similarity to the reference method process of certain activity. This interpretation assumes the ability to compare examined and reference phenomenon in the sense of criteria scale." A key feature of performance concepts applicable to profit and non-profit organisations could be the measurement and management of technical efficiency.

There is a difference in efficiency measurement, and the focus differs depending on the target "customer." The main interest of social service providers (employed caregivers, social workers etc.) is safe premises and good working conditions (Lepir et al., 2017). Research published in the area of non-profit organisations and their performance is still scarce and underdeveloped (Sousa-Zomer & Miguel, 2018). A growing variety and diversity of performance evaluation are observed in healthcare delivery using health outcomes. Kasthurirathne et al. (2018) and van der Kooy et al. (2017) evaluated the capacity for clinical, socioeconomic and public health data sources to predict the need for various social service referrals. The evaluation should also consider Those factors attributed to "client orientation" domains (such as choice and continuity, prompt attention, quality of basic amenities, social consideration, and technical efficiency of facilities) in line with performance concepts and efficiency.

Over the past two decades, several researchers presented methods that allowed to measure efficiency

to be able to benchmark results. Tan et al. (2017) and Maslihatin (2016) filled a considerable gap in the literature by proposing methods to measure service and quality performance to improve the performance efficiency of an organisation. According to Maslihatin (2016), non-profit organisations have the following objectives: (i) provide convenience in service; (ii) provide the required information society; (iii) improve intimacy with the consumer; (iv) measure the technical efficiency; (v) reduce costs; (vi) optimise resource; (vii) simplify procedures, improve productivity; (viii) share information; (ix) more responds and improving e-literacy. The paper of Tan et al. (2017) analysed efficient and inefficient levels of service performance using the Data Envelopment Analysis (DEA) and Balance Scorecard (BSC) techniques to bridge the existing gap in performance measurement. Aiming to satisfy clients while achieving low cost and patronage (loyalty), service providers have been measuring the performance of a system perceiving it as an important task in management used for purposes of control and planning.

Traditional studies of the Data Envelopment Analysis (DEA) view systems as a whole when measuring the efficiency, ignoring the operation of individual processes within a system. However, Network DEA allows considering the evaluation of changes that occur within the process (Chodakowska & Nazarko, 2016). Lotfi et al. (2010) proposed a methodology named CINDB (Combined Interval Net DEA and BSC) to evaluate the performance of an organisation considering financial and non-financial perspectives. Input and output measures for the integrated DEA-BSC model are grouped in "cards" which are associated with BSC. The BSC provides a clear representation of the relationship and logic between the key performance indicators (KPI) of four perspectives: financial, customer, internal process, and learning and growth. Also, Moullin (2017) performance management incorporated strategy mapping, service improvement, measurement and evaluation into the framework.

The methods were developed to support sustainability and to aid a high-quality measurement of performance. Other important research should be mentioned, i.e. by Bottani et al. (2017) who assessed sustainability at the organisation's level considering three key perspectives — economic, environmental and social — based on fuzzy logic and, in particular, on a monotonic hierarchical fuzzy inference tool as an effective means to gather the judgements and scores against the key performance indicators (KPIs) of each sustainability perspective into an aggregated index. Chodakowska and Nazarko (2016) presented the concept of environmental efficiency analysis based on the DEA in the case of desirable and undesirable results and illustrated by a case study of European countries. This assessment tool could be useful for benchmarking studies. At the same time, Raifman et al. (2018) presented their model for healthcare confounders to assess the quality of healthcare organisations which could be transferable into contributory and non-profit organisations. Finally, the leading model of efficiency evaluation is still based on works by Mook (2014) who developed a non-profit integrated social accounting (NISA) model, which considers particular objectives of non-profit organisations (achieving their mission and remaining viable as an organisation), their specific characteristics (e.g., the engagement of volunteers), and their economic, social and environmental impacts. The conceptual framework includes defining social accounting, setting the boundaries of the reporting entity, identifying the objectives of non-profit reporting, identifying the users of the accounts and their information needs, and considering the questions that must be answered to know whether the organisation is achieving its goals.

The NISA model incorporates four elements: (1) economic and human resources; (2) economic, social and environmental value creation; (3) internal systems and processes; and (4) organisational learning, growth and innovation. The NISA model provides a mechanism to address both functional and strategic accountability concerns of an organisation, its effectiveness and efficiency, and to drive its behaviour through feedback and readjustment. This is the main reason behind the wide use of the model in practice. Others models only improved methods of measurements or inputs for the model, as demonstrated by studies of Bittencourt et al. (2018) and Ventura et al. (2018) who focused on hospital capacity management to improve organisational performance and deal with increased demand in the healthcare sector. Their research determined operation measures, such as utilisation rate, waiting probability, estimated bed capacity, capacity simulations and demand behaviour assessment. The results showed space for improvement in capacity management, which is needed to manage technical capacity. The models are significant in helping profit and non-profit organisations to achieve their sustainability objectives and could help to create socially sustainable healthcare or social care

facilities (Herrera et al., 2017; Meza-Ruiz et al., 2017; Djukic & Maric, 2017; Kaczmarek, 2014).

The research gap was found in the area of performance measurement in public organisations, especially contributory organisations, which are co-financed from state and municipal budgets. Contributory organisations in the Czech Republic (founded in accordance with the law 250/2000 Coll.) are legal entities under the public law serving to perform tasks in the interest of the public, especially in the fields of education, culture and social care. The organisations are established by the state or territorial self-governing units of regions or municipalities. They are founded to perform activities to achieve goals that are not profit-based. Contributory organisations of territorial self-governing units are founded to provide beneficial or necessary services deemed as such by municipalities, regions and citizens. Usually, contributory organisations are established by territorial self-governing units (Matoušek et al., 2007). Research questions were formulated based on the findings: Is it possible to use technical efficiency to benchmark selected contributory organisations? Would it be possible to evaluate their performance using some models?

2. Research methods

There are several mathematical, statistical or other methods available for the evaluation of effectiveness, such as AHP or DEA Models (Franek & Kashi, 2017). The DEA model compares units with the best units. This method of estimating a production function is based on the linear programming theory. The method is used both in the private the public sectors (Dlouhý, Novosadová & Jablonský, 2007; Borůvková & Kuncová, 2012; Nazarko & Šaparauskas, 2014). So, it was selected as the best method to be used for the presented case study.

Technical efficiency measurement is presented in the form of a case study, in which six contributory organisations were selected from the field of care for older adults placed in residential social facilities operating in the Czech Republic. The study is based on secondary data collection. Comparison of the capacities of selected retirement homes was based on annual and activity reports of individual facilities. Annual reports allowed understanding ways used by individual facilities to adapt their services to client requirements and the market demand. The evaluation was based on annual reports for the years 2014-2016. The evaluation of the performance of selected retirement homes was made using the DEA model. The DEA model is a tool for estimating the technical efficiency of homogeneous production units. The evaluation process was realised in two models, namely, the input-oriented model (Model X) and the output-oriented model (Model Y). Each model had its specific inputs and outputs. The models were oriented towards constant yields of range (CRS) and variable yields (VRS). The data were processed using Microsoft Excel.

2.1. DEA Model process

DEA models are based on the fact that a set of production options is available for the problem and consists of all possible combinations of inputs and outputs. A set of production options is defined by an effective boundary. If a combination of the inputs and outputs of a unit is not within this limit, this is not an effective unit. Then, the number of inputs or outputs must be adjusted. An efficient unit (which lies at the limit of production possibilities) uses a small number of inputs on a large number of outputs. Each unit that produces certain effects (so-called outputs) consumes certain resources (inputs) for the production. By nature, outputs maximise as their higher value leads to higher performance of the tracking unit. On the other hand, there is the minimising nature, which relates to the use of inputs consumed by the production unit to create the effects. A lower value of these inputs leads to higher performance of the tracking unit (Toloo, 2014; Liu, Lu & Lin, 2013).

DEA models are oriented towards inputs (input-oriented models) or outputs (output-oriented models) or are slack-based models. Input-oriented models reduce the number of inputs while maintaining the current output, while output-oriented models suggest increasing the output while maintaining a given amount of inputs. Slack-based models represent a combination of both models. At the moment of reaching the effective boundary, there is a simultaneous reduction or increase of inputs and outputs (Toloo, 2014). In the case of scale yields, models can be classified into CCR models and BCC models. CCR models can be used within constant yields from a range, that is, if the unit input increases, the output will also increase by one unit. Here, conical data packaging is constructed. The weights of the inputs and outputs are set for each unit so that each unit achieves the maximisation of the technical efficiency coefficient, while the weights must not be negative

and the technical efficiency coefficients must not exceed the values of 1. Constant yields from a range are expressed in terms of:

$$f(tX, tY) = ft(X, Y) = tQ$$

where X represents the number of inputs consumed, Y is the number of outputs produced, t is any constant for which t ≠ 0. By meeting the condition that the unit efficiency is less than or equal to 1, the CCR maximises the efficiency model of the qth unit. The model calculates the input weight (v_j) and the output weight (u_i) to be as effective as possible for the nominal unit at the maximum unit efficiency of the other units. This model represents the role of linear angular programming expressed as:

Maximise:

$$z = \frac{\sum_i^r u_i y_{iq}}{\sum_j^m v_j x_{jq}}$$

Conditions:

$$\frac{\sum_i^r u_i y_{ik}}{\sum_j^m v_j x_{jk}} \leq 1 \qquad k = 1, 2, \dots, n,$$

$$u_i \geq \varepsilon \qquad i = 1, 2, \dots, r,$$

$$v_j \geq \varepsilon \qquad j = 1, 2, \dots, m,$$

Indicator z is the unit's efficiency Uq, ε represents an infinitesimal constant, by means of which the model ensures that all weights of inputs and outputs will be positive and will thus be at least somewhat included in the model, x_ik, i = 1,2,...,m, k = 1,2,...,n, is the i-th unit input value Ui and y_ik, i = 1,2,...,r, k = 1,2,...,n, is the value of the i-th output for the unit Ui. Using the Charnes-Cooper transformation, a standard role of linear programming can be obtained as:

Maximise:

$$z = \sum_i^r u_i y_{iq}$$

Conditions:

$$\sum_i^r u_i y_{ik} \leq \sum_j^m v_j x_{jk} \qquad k = 1, 2, \dots, n,$$

$$\sum_j^m v_j x_{jq} = 1$$

$$u_i \geq \varepsilon \qquad i = 1, 2, \dots, r,$$

$$v_j \geq \varepsilon \qquad j = 1, 2, \dots, m,$$

This model is marked as the primary CCR-based model (CCR-I primary model) where the optimal efficiency value is 1. For the model oriented to the outputs (the primary CCR-O model), the formula is expressed as:

Maximise:

$$g = \sum_j^m v_j x_{jq}$$

Conditions:

$$\sum_i^r u_i y_{ik} \leq \sum_j^m v_j x_{jk} \qquad k = 1, 2, \dots, n,$$

$$\sum_j^m u_i y_{iq} = 1$$

$$u_i \geq \varepsilon \qquad i = 1, 2, \dots, r,$$

$$v_j \geq \varepsilon \qquad j = 1, 2, \dots, m.$$

For the BCC model, variable yields to range are expected (increasing, decreasing, constant)

$$f(tX, tY) < resp. = resp. > tf(X, Y) = tQ$$

The X expresses the number of inputs consumed, Y the number of outputs produced and t is any constant for which this is valid t≠0. Conical data packaging in this case converts to convex. This means that there are more efficient units in the BCC than in the CCR models, only one unit is effective here, and efficiency in the BBC model should not be worse than in the CCR models. The mathematical model of the primary BCC model that is input-oriented (primary BCC-I model) can be expressed as:

Maximise:

$$z = \sum_i^r u_i y_{iq} + \mu$$

Conditions:

$$\sum_i^r u_i y_{ik} + \mu \leq \sum_j^m v_j x_{jk}, k = 1, 2, \dots, n,$$

$$\sum_j^m v_j x_{jq} = 1,$$

$$u_i \geq \varepsilon \qquad i = 1, 2, \dots, r,$$

$$v_j \geq \varepsilon \qquad j = 1, 2, \dots, m,$$

$$\mu - any\ value,$$

The μ defines a dual variable assigned convex condition e^T λ=1. In the CCR model, the value of the variable is equal to 0 (μ=0); however, the BCC model may be random. In addition to the zero value, both positive and negative values can be achieved. The primary BCC model oriented towards outputs (the primary BBC-O model) is formulated as:

Maximise:

$$g = \sum_i^m v_j x_{jq} + v,$$

under conditions:

$$\sum_i^r u_i y_{ik} \leq \sum_j^m v_j x_{jk} + v, \quad k = 1, 2, \dots, n,$$

$$\sum_i^r u_i y_{iq} = 1,$$

$$u_i \geq \varepsilon \qquad i = 1, 2, \dots, r,$$

$$v_j \geq \varepsilon \qquad j = 1, 2, \dots, m,$$

$$v - any\ value,$$

The v is the dual variable that belongs to the condition of convexity e^T λ=1 of the dual BCC-O model. For the BCC effective unit, the optimal value of the target function g^* is equal to 1, for inefficient units, values greater than 1, and it sets the rate of increase in output to reach the effective boundary.

Tab. 1. Basic statistical characteristics of inputs and outputs of the Model X for 2015-2017

	2015	2016	2017
min			
x1	1.02	1.03	1.01
x2	197.11	203.32	211.36
y1	388.61	402.46	415.12
max			
x1	2.08	2.03	1.98
x2	301.12	318.18	329.76
y1	451.25	464.51	472.31
mean			
x1	1.43	1.44	1.42
x2	225.34	232.79	242.06
y1	423.93	427.09	443.54
standard deviation			
x1	0.33	0.29	0.28
x2	34.57	39.14	40.27
y1	22.22	26.42	26.91

3. Research results

3.1. Basic characteristics of the models: inputs and outputs

In the input Model X, two inputs (x1, x2) and one output (y1) were selected. The input x1 represents calculated share of the number of beds per employee, the input x2 — wage costs per employee (in thousands of CZK/year) and the output y1 of the Model X is a share of total earnings per employee (in CZK thousands of CZK/year). Total revenues include revenues from the sale of services provided, fund revenue, other operating revenues, interest revenues and revenue (funds) received by the founder. The basic characteristics of inputs and outputs of the Model X are shown in Table 1 for all selected retirement homes for the years 2015-2017. The input x2 and the output y1 are given in thousands of CZK.

Tab.1 shows nearly constant development of the average input x1 in the reference period, while the input x2 shows wage cost per employee. The output y1 has a growing tendency. The values of the average share of the number of beds per employee (x1) reflect the humanisation in the facilities and the increase of capacities in some homes. The share of average total earnings per employee (y1) increased every year mainly due to higher transfers from the founders.

The Model Y was designed to evaluate the efficiency of one input (x1) and two outputs (y1, y2). The

Tab. 2. Basic statistical characteristics of inputs and outputs of the Model Y for the period 2015-2017

	2015	2016	2017
min			
x1	269.32	294.23	304.28
y1	86.11	71.53	99.43
y2	174.33	182.13	193.12
max			
x1	423.23	442.06	441.23
y1	212.36	192.29	217.39
y2	271.13	276.39	279.99
mean			
x1	321.15	335.33	344.85
y1	124.56	118.87	141.11
y2	213.19	223.77	231.34
Standard deviation			
x1	50.14	52.02	47.26
y1	47.04	44.09	39.65
y2	34.66	34.59	30.47

input x1 determines the amount of operating costs per one bed in the facility (in thousands of CZK/year) and outputs y1, y2 — the size of funds and operating incomes, also converted into beds used by clients (in thousands of CZK/year). Operating costs relate to the operating activities of the organisation and include the cost of consumed materials and energy, wages, insurance, depreciation, taxes, and other operating costs. In terms of operating revenues, it mainly includes revenues from the sales of services, from the use of funds and other revenues from the operation of the facility. Basic characteristics of inputs and outputs of the Model Y are given in Table 2 for all selected retirement homes for the years 2015-2017. The data are in thousands of CZK.

In Table 2, the growing tendencies of development were reflected by average values of the input x1 and the fluctuation tendency of the output y1. A slight upward trend was also observed for the output y2. The average cost per single bed (x1) increased each year. When comparing the year 2014 with the lowest average cost in the year 2017, there was a 4.3% increase. In terms of average funds of the founder per client (y1), it can be noted that the increase between 2015 and 2017 was 13.3%. The annually growing output y2 (average operating income per bed) can be positively evaluated.

3.2. Results of the analysed models

DEA of the Model X: the Model X displays input-oriented technical efficiency in constant yields of the range (CRS) and variable yields (VRS) in the analysed retirement homes (HE1 – HE6), see Tab. 3. The optimum unit efficiency ratio is 1. The inefficient units have an efficiency rate less than 1 and indicate the need to change inputs or reduce them to increase the efficiency of the unit (HE1 – HE6). The technical efficiency factor is, therefore, the interval <0;1>.

Table 4 shows the results of performance analysis focusing on technical efficiency in constant yields from a range where the same change in inputs is accompanied by the same change in outputs. Performance results are converted into percentages where effective units reach 100%, while inefficient units are less than 100%.

It is obvious from the table that the best values (100%) were achieved for the three-year period by HE2 except for the year 2015, HE4 in the year 2015, HE6 in 2016 and HE5 in 2017. HE3 was always in the interval 90-99% in years 2015-2017, HE5 was in this interval in 2015 and 2016. HE2 and HE5 were among the other effective units in the 90-99% range. The most inefficient institution was the HE1, which was the weakest in 2015 and 2017. In addition, the HE6 was low effective in 2015, at a range of 80-84%.

As for variable yields from the range, significant differences in performance can be observed compared to constant yields from the range, see Table 5. Most retirement homes reached or achieved almost 100% efficiency, especially in 2016 and 2017. Only one case was observed having a significant deviation from the optimal efficiency level for HE6 in 2015 with a lower threshold value below 89%.

Tab. 3. Results of the Model X according to CRS and VRS in 2015-2017

	2015		2016		2017	
	CRS	VRS	CRS	VRS	CRS	VRS
HE1	0.8421	0.9485	0.8726	0.9652	0.8253	1.0000
HE2	0.9263	0.9752	1.0000	1.0000	1.0000	1.0000
HE3	0.9011	0.9926	0.9161	1.0000	0.9428	1.0000
HE4	1.0000	1.0000	0,9696	1.0000	0.9375	0.9617
HE5	0.9297	0.9808	0.9247	1.0000	1.0000	1.0000
HE6	0.8362	0.8691	1.0000	1.0000	0.9337	1.0000

Tab. 4. Aggregate performance results of the Model X Constant Yields from a Range (CRS)

[%]	2015	2016	2017
100	HE4	HE2, HE6	HE2, HE5
99 – 90	HE2, HE3, HE5	HE3, HE4, HE5	HE3, HE4, HE6
89 – 85		HE1	
84 – 80	HE1, HE6		HE1

Tab. 5. Summary of Variable Range Performance Parameters (VRS) of the Model X

[%]	2015	2016	2017
100	HE4	HE2, HE3, HE4, HE5, HE6	HE1, HE2, HE3, HE5, HE6
99 – 90	HE1, HE2, HE3, HE5	HE1	HE4
89 – 85	HE6		
84 – 80			

Retirement homes with the level of effectiveness at the entry-level model below 100% should reduce their inputs or modify inputs and outputs proportionally. The input factors are the number of beds and the wage costs per employee in this case. By reducing them while retaining the output characteristics, their position in the model could be improved. However, the reduction in employee wages may lead to loss of motivation, work effort or termination of employment by employees. This would be mostly felt by the clients of the facilities, who would not be provided with services of a sufficient degree or quality. As far as the number of beds in homes is concerned, this would mean a considerable dissatisfaction of some existing clients who would have to leave the retirement home. At the same time, as the number of people interested in social service provision increases in facilities every year, this would result in an increased average waiting time and a reduced chance of getting a place.

DEA Model Y: the Model Y shows output-oriented technical efficiency, within constant yields of the range (CRS) and variable yields (VRS) in the analysed retirement homes (HE1 – HE6), see Table 6. The weight of the technical efficiency coefficient of the unit must equal to 1. The optimal coefficient rate is 1, while the inefficient units have a performance rate greater than 1. Technical efficiency factors must not be below 1. This model determines the optimal amount of inputs so that an inefficient unit could become an effective unit.

Table 7 shows the results of the performance analysis focused on technical efficiency within constant yields from the range. Performance results are converted to percentages where effective units reached 100%, while inefficient units had values greater than 100%. It can be noticed that in this model, the efficiency of a larger number of homes was higher than in the Model X. The two most efficient homes were HE2 and HE4, which remained such each year. HE6 reached 100% efficiency in 2016 and 2017, HE5 — in 2015. HE2, HE4 and HE6 homes did not need to increase their outputs to use inputs effectively.

The remaining retirement homes reached efficiency levels above 100%. The worst were HE1 and HE3 in 2015. In this case, homes that were not efficient in the output-oriented model need to increase their outputs while maintaining the input level x_1 (operating costs per one bed), or the numbers of inputs and outputs has to change proportionally. The monitored outputs were of the size of funds from the founder and operating income converted into per bed. Increasing the funds from founders of the retirement homes would provide more funding to help improve the quality of service provided to individual clients. For the founder, on the contrary, it would mean spending more money from the budget. The question, therefore, remains whether or not the founders (mostly the regions) would have additional funds available and whether they would be willing to provide them to the facilities. In the case of an increase in total revenues, it is possible to increase, for example, the offered services or, to extend the level of service offered to clients in the context of activities of

Tab. 6. Results of the Y-model according to CRS and VRS in 2015-2017

	2015		2016		2017	
	CRS	VRS	CRS	VRS	CRS	VRS
HE1	1.0076	1.0000	1.0027	1.0031	1.0022	1.0020
HE2	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
HE3	1.0057	1.0056	1.0036	1.0036	1.0002	1.0007
HE4	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
HE5	1.0000	1.0000	1.0026	1.0000	1.0031	1.0000
HE6	1.0037	1.0016	1.0000	1.0000	1.0000	1.0017

Tab. 7. Summary performance results of constant range yields (CRS)

[%]	2015	2016	2017
100	HE2, HE4, HE5	HE2, HE4, HE6	HE2, HE4, HE6
100,01 – 100,20		HE1, HE5	HE1, HE3
100,30 – 100,40	HE6	HE3	HE5
100,50 – 100,60	HE3		
100,70 +	HE1		

Tab. 8. Summary performance results of variable yields from a range (VRS) in the Model Y

[%]	2015	2016	2017
100	HE1, HE2, HE4, HE5	HE2, HE4, HE5, HE6	HE2, HE4, HE5
100,01 – 100,20	HE6		HE1, HE3, HE6
100,30 – 100,40		HE1, HE3	
100,50 – 100,60	HE3		
100,70 +			

Tab. 9. Results of the Model X within constant yields from a range (CRS) and variable yields form a range (VRS)

2015	HE1	HE2	HE3	HE4	HE5	HE6
CRS	0.8421	0.9263	0.9011	1.0000	0.9297	0.8362
VRS	0.9485	0.9752	0.9926	1.0000	0.9808	0.8691
2016						
CRS	0.8726	1.0000	0.9161	0.9696	0.9247	1.0000
VRS	0.9652	1.0000	1.0000	1.0000	1.0000	1.0000
2017						
CRS	0.8253	1.0000	0.9428	0.9375	1.0000	0.9337
VRS	1.0000	1.0000	1.0000	0.9617	1.0000	1.0000

Tab. 10. Results of the Model Y within constant yields from a range (CRS) and variable yields from a range (VRS)

2015	HE1	HE2	HE3	HE4	HE5	HE6
CRS	1.0076	1.0000	1.0057	1.0000	1.0000	1.0037
VRS	1.0000	1.0000	1.0056	1.0000	1.0000	1.0016
2016						
CRS	1.0027	1.0000	1.0036	1.0000	1.0026	1.0000
VRS	1.0031	1.0000	1.0036	1.0000	1.0000	1.0000
2017						
CRS	1.0022	1.0000	1.0002	1.0000	1.0031	1.0000
VRS	1.0020	1.0000	1.0007	1.0000	1.0000	1.0017

the facility. Increasing staff expertise and qualifications can also be a key to success.

Regarding variable yields from a range (VRS), 100% efficiency was achieved annually for most retirement homes, see Table 8. In 2017, however, retirement homes HE1, HE3 and HE6 reached an average of around 100.10%. In this case, however, it cannot be said that this is a poor indicator of their activity. There is some possibility of further improvement. Best performance results were reached by HE2, HE4 and HE5 in 2017.

In the analysed period, the worst position was held by HE3 in the model VRS with an average efficiency of 100.56%. In 2015 and 2016, HE1 (100.76% for 2014 and 100.27% for 2016) and HE5, HE5 obtained in the CRS model in 2016 (100.26%) and 2017 (100.31%).

Model X and Constant Yields: When comparing the results of the technical efficiency in Model X within constant yields of the range (CRS) and variable yields of range (VRS), the VRS values for individual retirement homes were better than in the CRS model. In 2015, only one retirement home, HE4, was fully effective in terms of technical efficiency. HE2 and HE6 were fully effective in 2016. HE3, HE4 and HE5 were fully effective only in the VRS model in 2016 (Table 9). In 2017, HE2 and HE5 were fully effective (both in the CRS model and in the VRS model). Full efficiency in the VRS model was reached by HE1, HE3 and HE6 in 2017, see Table 9.

Model Y and Constant Yields: When comparing the results of technical efficiency in the Model Y within constant yields of range (CRS) and variable yields of range (VRS), VRS values for individual

homes were the same as in the Model X, the results were better than in CRS.

However, compared to the Model X in terms of revenues from the scale, there were more efficient homes in the analysed period 2015-2017, see Table 10. HE2, HE4 and HE5 achieved the best results in 2015. In addition to these homes, the HE1 achieved full efficiency in the VRS model and the remaining homes were fully effective within the VRS model. As far as the CRS model is concerned, the individual results were above the optimal level of 100% efficiency. In both models, HE2, HE4 and HE6 achieved the best results in 2016. Also, fully effective was HE5 in the VRS model in 2016. Full efficiency achieved HE2 and HE4 in both models in 2017. Moreover, HE5 was fully efficient in the VRS model in 2017. In the CRS model, it was HE6 in 2017.

4. Discussion of the results

Evaluations have shown that the results of the output-oriented Model (Model Y) are better as they show more effective retirement homes compared to an input-oriented model (Model X). The results of technical efficiency modelling both in the Model X and the Model Y show that better results over the three-year period were achieved by homes in the VRS model (variable yields from a range) than the CRS model (constant yields from a range), not only in terms of the number of effective retirement homes (an effective unit is equal to 1, an inefficient unit is lower/higher than 1), but also within the resulting values of technical inefficiency of individual retirement homes. The number of effective units in the CRS-oriented model was one or two in incremental years; for the VRS-based model, it was one home for the first year (2015) and five homes for the elderly in the next two years. In the CRS-based model, some retirement homes achieved technical efficiency rates lower than 85% in 2015, 2016 and 2017. This was specifically the case of HE1 in 2015 and 2016, and HE6 in 2015. The situation in the VRS model orientation was better. There, most retirement homes tended to be effective. Ineffective units should adjust (reduce) their inputs to reach an effective limit. The monitored inputs (x1, x2) in the Model X were the number of beds per employee and the wage costs per employee.

In the output-oriented model (Model Y), the situation is very similar to the Model X. Here, the number of technically efficient units (retirement homes) within the VRS was greater than within the CRS-oriented model. The number of effective units in the CRS-oriented model was three in each year; for the VRS-based model, this ranged from three to four homes. It can be said, therefore, that the Model Y achieved full efficiency for more retirement homes within the CRS model than this was in the case of the Model X. As for the homes that were not fully effective, it can be said that their level was mostly tight above the threshold of effective level. The worst results in the CRS-oriented model were achieved by three homes in 2015, namely, HE1, HE3 and HE6 with an efficiency rate of more than 100.37%. In 2016, it was HE1, HE3 and HE5 with an efficiency rate of more than 100.36%, and in 2017, HE1 and HE5 with an efficiency rate of more than 100.31%. In the VRS model, this was HE3 in 2015, HE6 with an average value of more than 100.16%; HE1, HE3 with an average value higher than 100.31% in 2016; and HE1 and HE6 with an average value of 100.17% in 2017. Ineffective retirement homes should try to increase outputs while maintaining input values. Outputs, in this case, are funds from founders and operating income per one bed. Another possibility could be associated with a proportional change of inputs and outputs. This problem motivated to compare optimistic results

Tab. 11. Comparison of technical efficiency in different sources based on DEA

Authors	Country	Focus group/sample	period	Technical efficiency
Case study	CZ	Retirement homes (6)	2015-2017	85% to 93%
Borůvková & Kuncová, 2012	CZ	Eye care clinics (4)	2009-2011	80%
Dlouhý, Novosadová & Jablonský, 2007	CZ	Hospitals (22)	2003	86%
Vaňková & Vrabková, 2014	CZ	Hospitals (17)	2010-2012	Average 90%
Björkgren et al., 2001	FI	Nursing homes (65)	1995	85% to 87%
Garavaglia et al., 2011	IT	Nursing homes (40)	3 years	78% to 85%
Luasa et al., 2013	IRL	Nursing homes (39)	-	63%

with previous studies, published before, but based on the DEA model evaluation (Table 11).

In comparison with rather similar studies based on DEA models, the performance rate was higher in the presented study than in studies conducted by other authors, which may signal about limitations: (i) a small sample of contributory organisations; (ii) a different time period, iii) different systems of payment for social care in social services in different countries.

Conclusions

Relevant and unique results were obtained by modelling the technical efficiency according to DEA models, but the evaluation was limited by selecting the assessed set of production units (retirement homes) and by selecting input and output parameters that limit the view of efficiency results for individual retirement homes. However, the methodology for the analysis and evaluation of technical efficiency has been presented both for organisations and their founders.

The DEA approach has been used to measure the performance of service providers from different areas to know their service levels. It also analyses the quality of service by making use of different cross-efficiency data envelopment analysis models to discriminate the units.

The technical efficiency evaluation should be taken as a sub-evaluation of an organisation as a part of the organisation's overall performance evaluation. The paper aims to provide a case study on the assessment of the technical efficiency of non-profit organisations and ways to perform benchmarking. However, it is important and necessary to obtain input and output information. These parameters should be selected with respect to what the organisation wants to monitor and evaluate.

The technical efficiency of retirement homes as contributory organisations has been investigated within an input-oriented model (Model X) and an output-oriented model (Model Y), with a focus on constant and variable yields on the scale (CRS and VRS). The value of 100% seems to be effective. Though, achieving 100% of technical efficiency does not always represent everything that should be achieved. Attention should also be paid to the qualitative aspect of evaluation, which includes the assessment of client and employee satisfaction, judgement of whether the social services are provided to the appropriate degree and quality, and evaluation of the overall reputation of the residential social facilities. This technical efficiency should be a part of the prepared comprehensive performance evaluation model where partial indicators would be developed to assess the effectiveness of non-profit organisations.

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