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Contents

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Towards a readiness model derived from critical success factors, for the general data protection regulation implementation in higher education institutions

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Abstract
Background: Present the relevance of the study and highlights the key points of literature overview.
Purpose: As of May 25, 2018, General Data Protection Regulation (GDPR) has become mandatory for all organizations, public or private, that handle personal data of European citizens, regardless of their physical location. Higher education institutions (HEIs), namely public universities, are no exception to this requirement and, as in many other organizations, many HEIs begin the process of implementing the GDPR without meeting the minimum conditions necessary for implementation. The purpose of this study, therefore, is to present a model to determine the level of readiness of HEIs regarding the implementation of the GDPR.
Study design/methodology/approach: With the objective of designing a new artefact as a readiness model for the implementation of the GDPR, this study follows Design Science Research as an approach to be used to build the readiness model, based on a set of 16 critical success factors (CSFs) previously determined.
Findings/conclusions: A readiness model was designed, based on a set of 16 CSFs related to the implementation of GDPR in HEIs.
Limitations/future research: This is a new area of study that needs further development, namely through the practical application of the model, allowing the improvement of the measurement levels of the different CSFs.
Practical implications: The determined readiness model allows HEIs to realize a priori if they have the necessary conditions for the implementation of the GDPR, giving useful indications of the organizational dimensions and the CSFs that compose them where better performance is necessary to ensure a successful implementation.
Originality/Value: As far as we know, this is the first model of readiness based on CSFs related to the implementation of GDPR in HEIs, being therefore a first contribution to the development of this area.

Keywords
general data protection regulation; critical success factors; design science research; readiness model; maturity model; higher education institutions

Introduction

If it is true that the increasing use of information technologies has brought advantages by facilitating access to electronic services, provided by the State and by private organizations, it is also true that we can face a set of threats and risks here, namely, improper access to personal information. The themes of privacy and, consequently, that of data protection that concerns everyone, have been the subject of study for several decades, but they have never been as current as now due to the fact that every day, information is published, consulted, processed and stored our respect (Gstrein & Beaulieu, 2022; Staff, C.A.C.M., 2021; Wu, Vitak, & Zimmer, 2020). On the other hand, the collection and storage of personal information has become the basis of the commercial activity of many companies, being sometimes illegal because it is carried out without consent and without any type of control by the supervisory authorities.

In this scenario, it is critical to proceed with the application of the General Data Protection Regulation (GDPR), based on which the protection of the privacy of data subjects will be improved, allowing different organizations to work with clear rules and achievable requirements (Hoofnagle, van der Sloot & Borgesius, 2019; Li, Yu & He, 2019; Crutzen, Peters & Mondschein, 2019). As universities are institutions that constantly deal with personal data relating to students, teaching staff, technical, administrative and management workers, researchers and other workers, it is observed that there are many challenges that are posed to them with the entry into force of the GDPR. Namely, through the need for self-regulation, the need to demonstrate that they are carrying out the different data processing operations in accordance with what is advocated in the new regulation, the need to adapt to the new requirements, such as information portability, the right to be forgotten, the design of systems to guarantee the privacy from the moment they are built or even the need for a Data Protection Officer (DPO), all this will require a profound change in the way these institutions work (Habbabeh, Schneider & Asprion, 2019). To this extent, it is important to ensure, a priori, with an adequate level of performance, the factors that are critical for the successful implementation of the GDPR in national public universities (Fernandes, Machado & Amaral, 2022; Syed, Bandara, French & Stewart, 2018). These factors, called by Rockart (1979) CSFs, are "… areas of activity that should receive constant and careful attention from management" (Rockart, 1979, p.85).

The main aim of this paper is therefore to define a readiness model derived from CSFs, for the implementation of general data protection regulation in higher education institutions.

Beginning with a brief background analysis, in the following Section 2, the 16 CSFs that will be the basis for the construction of the readiness model will be presented. Section 3 sheds light on the research methodology adopted. In Section 4, the readiness model for the implementation of the GDPR will be presented. The main results, the final considerations, limitations and future work, will be discussed, respectively in Section 5 and in the conclusion session. Through the analysis of the performance level of the obtained 16 CSFs HEIs are able to understand which are the organizational areas that need more attention from management, reinforcing, this way, the allocation of resources and means to the process of implementation of the GDPR, contributing in a very positive way to the theoretical and practical development of this area of research, since it is the first model of readiness based on CSFs related to the implementation of GDPR in HEIs.

1. Background

The entry into force of the GDPR on May 25, 2018 made it mandatory for public and private organizations dealing with personal data to adapt to a new reality, where data subjects have new rights, and those responsible for data processing operations are required to demonstrate compliance with GDPR to national supervisory authorities. This new reality requires time for those responsible to adapt processes and technological infrastructure to support the organization's activity, as well as the financial and human resources necessary for its implementation (Tikkinen-Piri, Rohunen & Markkula, 2018).

Universities are organizations where there is typically an enormous amount and diversity of personal data, some of which are sensitive, concerning their students, teachers, researchers and staff, namely the academic records, the health records, the financial records, the site usage and searches records, the records of extracurricular activities, the records of donations, the photographs, the disciplinary processes, and other personal documents (Podnar, 2017; Marković,

Debeljak & Kadoić, 2019). Therefore, the application of GDPR is mandatory (Podnar, 2017).

This obligation to comply with the GDPR makes universities much more accountable for the data they have, having to justify to national supervisory authorities, their possession, the way they are collected, stored, disposed of and accessed by their teachers, researchers and staff (Cormack, 2017; Marković et al., 2019).

However, compliance with the GDPR causes great difficulties, constraints and challenges for organizations, in terms of the lack of implementation guides with practical orientations for the specific sector of activity, the need for investment in new hardware and software, in hiring specialized human resources, or in the education and training of workers (Gabriela, Cerasela & Alina, 2018).

Universities are no exception to this reality, being organizations that deal with personal data and that have a very specific organizational culture (Podnar, 2017), and in this sense, the legal need to demonstrate compliance with the GDPR causes its implementation to start many times without ensuring that the factors that are critical to the implementation have a level of performance appropriate (Teixeira, Silva & Pereira, 2019). These factors are, as we saw earlier, called by Rockart (1979) as CSFs. For Mufti, Niazi, Alshayeb and Mahmood (2018) readiness model can be defined "as a technique to assess an organization or team based on the specified criteria to represent their level of readiness" (Mufti et al., 2018, p.28613). For Schumacher, Erol, and Sihn (2016), a readiness model seeks to capture "… the starting-point and allow for initializing the development process" (Schumacher et al., 2016, p.161). Public and private organizations are in the process of implementing the GDPR, with some more advanced than others (Laybats & Davies, 2018). However, it is essential that they know the level of readiness they are on to successfully implement the new data protection regulation (Tikkinen-Piri et al., 2018; Privacy Culture, 2019; Lok, Opoku & Baldry, 2018; Dove, 2018). Thus, driven by the need to capture the starting point of the implementation process in the form of the necessary conditions to implement the new data protection regulation, a readiness model is presented, whose main objective is to determine the level of readiness of an HEI, and in particular, a university, to implement the GDPR successfully. This model, as well as the 16 CSFs that comprise it, related to the implementation of GDPR at universities, are some of the practical results of the research work carried out under the PhD in Business Sciences.

Design Science Research was used as a research methodology for generating the readiness model, justified by the fact that the generation of a model while still an artifact fits into one of the possible results of this type of methodology (Hevner & Chatterjee, 2010; Hevner, March, Park, & Ram, 2004; Peffers, Tuunanen, Rothenberger & Chatterjee, 2007; Vaishnavi & Kuechler, 2004).

2. Critical success factors to GDPR implementation in HEIs

As previously mentioned, the readiness model that will be presented in the following sections is based on a set of 16 CSFs related to the implementation of GDPR in HEIs, in particular at public universities. These 16 CSFs, as well as the readiness model presented, are both empirical results of a Ph.D. in Business Administration. Before proceeding to the description of the readiness model, it is therefore important to present the list of 16 CSFs on which the model is based. The research strategy used in its identification was based on a multiple holistic case study focused on Portuguese public universities. In Portugal, the public university higher education system consists of 14 universities (excluding the Military University Institute), each with a Data Protection Officer (DPO).

To determine the 16 CSFs, an invitation was made to the DPOs of the 14 universities to participate in the study, with 8 accepting the invitation with the condition that their participation be made anonymously. Several research methods were used, predominantly qualitative, namely the method of Caralli, Stevens, Willke and Wilson (2004). Thus, when applying the method by Caralli et al. (2004), semi-structured interviews were conducted with 8 DPOs from 14 Portuguese public universities, who agreed to participate in the study. The interviews lasted a total of 10 hours, 30 minutes and 20 seconds. Then, according to the criteria defined by Azevedo et al. (2017), transcripts of the interviews were carried out, resulting in 100,588 characters. After this, the method of Caralli et al. (2004) was applied in the analysis of the transcriptions, resulting in 440 activity statements, which according to Caralli et al. (2004) represent what the organization is doing or what it should be doing in any activity or project to achieve success. These 440 activity statements were then grouped into 30 affinity groups with

some similarity to each other, with each set being assigned a designation named of the support theme, which characterizes all the activity statements contained in that group. The list of 30 CSFs was then derived from the 30 supporting themes.

Then, another research method was applied, more specifically, the Delphi method (Keeney, McKeena & Hasson, 2011; Okoli & Pawlowski, 2004) to prioritize the 30 CSFs previously obtained, having been selected as panel of experts, the 8 DPOs of the national public universities who agreed to continue participating in the study. In order to reach consensus among the panel members (Schmidt, 2007) regarding the ranking to be attributed to the 30 CSFs, two rounds were necessary to complete the process, namely, when a Kendall coefficient of agreement of 0.788 was obtained, and one stability coefficient between rounds measured by Spearman's RHO coefficient of 0.977, complemented by a Kendall tau b of 0.899.

As the 30 CSFs were placed in a global ranking, it was now important to determine the subset of CSFs of greatest importance for the DPOs who were part of the panel of experts of the Delphi method. Thus, the hierarchical cluster analysis technique was used as a way to detect, in the set of 30 CSFs, groups or clusters of CSFs with some statistical homogeneity between them. For the use of this technique, the mean and the respective standard deviation were used as a statistical measure of the proximity between cases or CSFs as they fully characterize each of the 30 CSFs that integrate the ranking with the final 30 CSFs obtained by applying the method of Delphi. The quadratic Euclidean distance was used as a measure of distance between the cases or CSFs under analysis, as well as Ward's connection algorithm to group the cases or CSFs into clusters. In this way, as a result of the application of the hierarchical cluster analysis technique, a list of 16 CSFs related to the implementation of GDPR at universities was obtained, which is presented below, and which will be the basis of the readiness model presented in the following sections.

Table 1 List of 16 CSFs related to the implementation of the GDPR in Universities

	List of 16 CSFs related to the implementation of GDPR in Portuguese public Universities
CSF-1	Empower workers on the GDPR.
CSF-2	Commit top management, with the GDPR.
CSF-3	Implement the GDPR with the involvement of management and workers.
CSF-4	Create a culture for data protection.
CSF-5	Ensure the security of information held by the HEI.
CSF-6	Adapt the Information Systems to the GDPR.
CSF-7	Implement the GDPR with the least negative impact on the HEI.
CSF-8	Use a progressive approach in the implementation of the GDPR.
CSF-9	Start the implementation of the GDPR, by surveying the process network.
CSF-10	Adapt data processing operations to the GDPR, with minimal impact on the HEIs mission.
CSF-11	Conduct security audits generating evidence of the degree of GDPR compliance.
CSF-12	Guarantee the necessary resources and means for the DPO.
CSF-13	Create a decentralized team of pivots for data protection.
CSF-14	Create institutional communication channels dedicated to the GDPR.
CSF-15	Adopt a computer application that allows integrated management of the GDPR operationalization.
CSF-16	Implement a change management process around the GDPR.

Source: the authors

Analyzing the list of 16 CSFs in the table above, it is possible to organize them in 6 organizational dimensions. Thus, we find that 4 CSFs are related to the Human Resources Dimension (CSF 1, 2, 3 and 13), 1 CSF to the Organizational Culture Dimension (CSF 4), 1 CSF to the Financial Dimension (CSF 12), 6 CSFs to the Procedural Dimension (CSF 7, 8, 9, 10, 14 and 16), 3 CSFs to the Information Systems and Technologies Dimension (CSF 5, 6 and 15) and 1 CSF with the Quality Dimension (CSF 11).

3. Research methodology

For the design of the readiness model, this study uses Design Science Research as an approach to research, following the guidelines defined by Hevner et al. (2004) as well as the sequence of processes defined by Peffers et al. (2007). According to Hevner and Chatterjee (2010), Design Science Research is a research paradigm that, through the creation of useful and innovative artifacts, seeks to answer practical questions posed

to people in their daily lives. Thus, according to Ojo, Curry, Janowski and Dzhusupova (2015), Design Science Research "creates and evaluates artifacts that define ideas, practices, technical capabilities, and products through which the analysis, design, implementation and use of information systems can be effectively accomplished" (p.4).

In this study, the domain of application of Design Science Research is related to the creation of an artifact as a model that allows identifying the level of readiness of universities for the implementation of GDPR in HEIs. The problem to be solved involves people, structures, processes, implementation strategies and aspects related to the organizational culture; therefore, the space where the study phenomenon resides is properly framed in the Design Science Research framework defined by Hevner et al. (2004). The following table details the type of Design Science Research (Hevner et al., 2004; Ojo, Curry & Janowski, 2014).

Table 2 Type of Design Science Research

Guideline	Description	Readiness Model Instance
1 – Design as an Artifact	Design-science research must produce a viable artifact in the form of a construct, a model, a method, or an instantiation.	We developed and artifact, in the form of a readiness model prototype to the implementation of the GDPR at universities.
2 – Problem Relevance	The objective of design-science research is to develop technology-based solutions to important and relevant business problems.	The prototype of the readiness model, aims to solve the problem of organizations, namely in HEIs that start the implementation of GDPR without having guaranteed a good performance of the CSFs that are necessary for the implementation to be successfully completed. On the other hand, it will also allow to assess, a priori, the existence and good performance of these CSFs, and if they do not exist or are not performing adequately, it will allow the necessary conditions to be created so that they can be adjusted to the necessary level.
3 – Design Evaluation	The utility, quality, and efficacy of a design artifact must be rigorously demonstrated via well-executed evaluation methods.	The adequacy of the prototype of the GDPR readiness model to the intended purpose, should be assessed, in subsequent stages, namely in the scope of future research, through a case study. The comments that may be collected regarding the performance of the prototype of the readiness model, will be useful for it to be improved, thus increasing its suitability to reality. The prototype of the model as a developed artifact can be evaluated in terms of its fidelity to real-world phenomena, integrity, level of detail, robustness and internal consistency (March & Smith, 1995).
4 – Research Contributions	Effective design science research must provide clear and verifiable contributions in the areas of the design artifact, design foundations, and/or design methodologies.	The prototype of the readiness model, with the different CSFs and levels of evaluation, translates into an effective contribution to the domain of study, related to the issue of the implementation of GDPR in the University context, thus increasing the existing knowledge base.
5 - Research Rigor	Design science research relies upon the application of rigorous methods in both the construction and evaluation of the design artifact.	The prototype of the model built will serve as a knowledge base the 16 CSFs that were previously obtained through the application of rigorous data collection and analysis procedures, previously described. The prototype of the readiness model will be built based on the 16 determined CSFs, using different levels to assess the degree of performance of the CSFs.
6 – Design as a Search Process	The search for an effective artifact requires utilizing available means to reach desired ends while satisfying laws in the problem environment.	The prototype of the model will be built based on a set of information collected in previous stages of the process. The execution of the design cycle, as the central cycle of Design Science Research, will allow, in consecutive stages of design and evaluation, the improvement of the prototype of the readiness model until the desired level is reached (Hevner et al., 2004).
7 – Communications of Research	Design science research must be presented effectively both to technology-oriented as well as management-oriented audiences.	The prototype of the readiness model will be presented in the doctoral thesis, in scientific journals, conferences of the specialty, as well as in the DPOs of universities.

Source: Adapted from Hevner et al. (2004, p.83) and Ojo et al. (2014, p.4).

It is now important to present the research framework adopted for the development of the readiness model, which is an instantiation of the framework defined by Hevner et al. (2004). In developing the research framework, the work already done by Habbabeh et al. (2019) was taken in account.

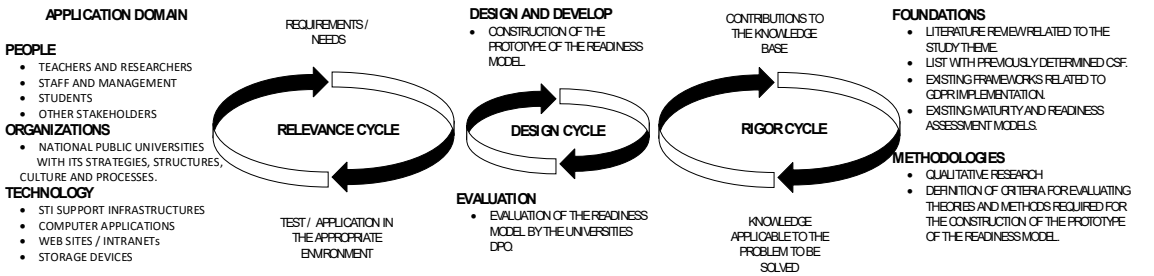

Figure 1 Research Framework for the development of the readiness model
Source: Adapted from Hevner et al. (2004) and Habbabeh et al. (2019, p.224)

On the left side, we can find the space where the phenomenon of interest centered on HEIs resides and where the requirements for the prototype of the readiness model as an artefact are defined as a problem to be solved. The definition of requirements and the assessment of their conformity should be carried out in a continuous relevance cycle, until the readiness model fully responds to the requirements initially identified. In this context, it incorporates people as workers from different professional classes, students and other stakeholders who interact with the university and on whom there is a need to proceed with data protection, applying GDPR conveniently. Then there is the organization, with its data protection strategies, with its structures, culture and processes that shape it. And finally, we have the technology, with the infrastructures, websites, intranets, and other information storage, which allow the operationalization of the strategy defined, superiorly, for the implementation of the GDPR.

On the right side, we have the base where the knowledge necessary to build the artefact as a readiness model is found, being this diversified. More specifically, it will resort to the literature review already carried out related to the study theme, to existing frameworks already analyzed and that also relate to the subject of study, to existing models that allow the assessment of the readiness levels and, mainly, to the 16 CSFs that were previously obtained through the application of rigorous data collection and analysis procedures involving the use of different techniques. What is being sought now is the construction of a readiness model as an artefact, which can be, in the scope of future research, improved through the evaluation and contribution of the DPOs of Portuguese public universities. We also have the methodologies used in the justification and evaluation phase of the created artefact. The rigor cycle is executed continuously, through a process that allows the acquisition of new knowledge, with later incorporation in the model of readiness, until, it is considered that it fully complies with the requirements initially determined.

Finally, we have the central cycle, the most critical one, where in successive interactions, the design and development of the readiness model is carried out. This cycle is being fed with the requirements and tests carried out by the relevance cycle, and for the knowledge obtained continuously through the cycle of rigor.

Based on the research framework in figure 1 as well as steps 1 - Identify a problem, 2 - Define objectives as a Solution, 3 - Design and Development an Artifact and 6 - Communication, from de process model defined by Peffers et al. (2007), the readiness model was designed. Like in other studies (Brendel, Zapadka, & Kolbe, 2018), Steps 4 - Evaluation and 5 - Demonstration, were not implemented, being considered for the next phase, in future work.

4. Readiness model for the implementation of the GDPR

The 16 CSFs previously defined will be the basis for the development of the readiness model. Therefore, it is necessary to assess the performance

level of each of the 16 CSFs. To proceed with the evaluation, the following structure was chosen (Nur Mardhiyah 2013; Tapia, 2009):

- Type of evaluation: The evaluation of each CSF is carried out individually and sequentially, from CSF 1 to CSF 16.
- Levels of the evaluation system: A scale with 5 evaluation levels (level 1 to level 5) will be used to measure the level of performance of each CSF. Models with 5 evaluation levels are widely used in CMM-related maturity models (Eadie, Perera, & Heaney, 2012), as well as in readiness models (Olszak & Mach-Król, 2018; Akbar, Mahmood, Huang, Khan & Shameem, 2020).
- Assessment system: A cumulative assessment system (or measuring model) will be used (Nur Mardhiyah, 2013), meaning that when assessing a CSF at level *n*, one must ensure that level *n-1* is already met.
- Assessment structure: The assessment structure consists of 5 levels, starting with the lowest level - level 1, which determines the allocation of 1 point, progressing to the highest level - level 5, which determines the allocation of 5 points.

Having defined the rules to be used in the assessment of the 16 CSFs as a basis for the readiness model, it is now important for each CSF to indicate the respective assessment structure. For that, different maturity and readiness models that already exist were considered as a starting point. The following table summarizes the proposed evaluation structure for the 16 CSFs.

Table 3 Evaluation structure for the 16 CSFs based on different maturity and readiness models that already exist

CSF	CSFs Assessment Levels	Measurement Model of CSF Performance Level – Adapted from
CSF-1	Level 5 - Continuous training; Level 4 - Structured training; Level 3 - Focused training; Level 2 - Informal training; Level 1 - No training.	Nur Mardhiyah (2013); Thomson and Von Solms (2006)
CSF-2	Level 5 - Commitment, with monitoring and evaluation; Level 4 - Commitment, with frequent interaction; Level 3 - With commitment; Level 2 - With minimal commitment; Level 1 - No commitment.	Nur Mardhiyah (2013)
CSF-3	Level 5 - Permanent involvement; Level 4 - Effective involvement; Level 3 - Informal involvement; Level 2 - Symbolic involvement; Level 1 - No involvement.	Ives and Olson (1984)
CSF-4	Level 5 – Optimized; Level 4 – Embedded; Level 3 – Defined; Level 2 – Development; Level 1 - Ad hoc.	The Department of Internal Affairs (2014)
CSF-5	Level 5 - Total compliance; Level 4 - Acceptable compliance; Level 3 - Basic compliance; Level 2 - Initial compliance; Level 1 - Non-compliant.	Saleh (2011)
CSF-6	Level 5 - Optimized; Level 4 - Managed; Level 3 - Defined; Level 2 - Repeatable; Level 1 - Initial.	Woodhouse (2008)
CSF-7	Level 5 - Optimized; Level 4 - Managed; Level 3 - Defined; Level 2 - Repeatable; Level 1 - Initial.	Domingus (2017)
CSF-8	Level 5 - Adaptable; Level 4 - Adoptive; Level 3 - Defined; Level 2 - Exploratory; Level 1 - Unaware.	Morgan (2011)
CSF-9	Level 5 - Optimized; Level 4 - Managed; Level 3 - Defined; Level 2 - Repeatable; Level 1 - Ad hoc.	AICPA/CICA (2011)
CSF-10	Level 5 - Optimized; Level 4 - Managed; Level 3 - Defined; Level 2 - Repeatable; Level 1 - Initial.	MetaCompliance (2017)
CSF-11	Level 5 - Optimized; Level 4 - Mature; Level 3 - Compliant; Level 2 - Managed; Level 1 - Initial.	Uttam, Kumar & Sujoy (2013)
CSF-12	Level 5 - Optimized; Level 4 - Predictable; Level 3 - Defined; Level 2 - Managed; Level 1 - Initial.	Curtis, Hefley and Miller (2009)
CSF-13	Level 5 - Adaptable; Level 4 - Adoptive; Level 3 - Defined; Level 2 - Exploratory; Level 1 - Nonexistent.	Morgan (2011)
CSF-14	Level 5 - Continuous improvement; Level 4 - Managed and focused; Level 3 - Structured and proactive; Level 2 - Reactive; Level 1 - Initial.	UNECE (2019); Kolomiyets (2020)
CSF-15	Level 5 - Optimized; Level 4 - Integrated; Level 3 - Defined; Level 2 - Development; Level 1 - Initial.	PAHO (2020)
CSF-16	Level 5 - Organizational competence; Level 4 - Organizational standards; Level 3 - Multiple projects; Level 2 - Isolated projects; Level 1 - Ad-hoc or absent.	Prosci (2004)

Source: the authors' own elaboration

In the previous table for the 16 CSFs, and considering that the 16 CSFs are ranked in descending order in relation to their degree of relevance, it was understood to weigh the different CSFs differently. The calculation of the level of readiness for each CSF follows the following principles:

- A first weighting is carried out for each CSF according to its position or relevance. In this way, CSF 1, the most important CSF will have an added weight of 100% in relation to the number of points assigned to it, CSF 2 will have an added weight of 87.5% in relation to the number of points assigned to it, the CSF 3 will have an added weight of 81.25% in relation to the number of points assigned to it, and so on until we reach CSF 16 (least important CSF), which has no added weight in relation to the number of points assigned to it.
- With a second weighting, it is guaranteed that the increase previously attributed is different, depending on whether the CSF has been assessed at level 1, 2, 3, 4 or 5. Thus, for example, for CSF 1 which is the most relevant CSF , has a score increase of 100% distributed as follows: if the level at which it was assessed is level 1, the score awarded is 1 point (its value); if the level at which it was assessed was level 2, the score awarded is 2.5 points (its value plus 25%); if the level at which it was assessed was level 3, the score awarded is 4.5 points (its value plus 50%); if the level at which it was assessed was level 4, the score awarded is 7 points (its value plus 75%), if the level at which it was assessed was level 5, the score awarded is 10 points (its value increased by 100%).

In the following table (Table 4), we can see the different scores that each CSF can obtain, considering the aforementioned weights.

Table 4 Weighting attributed to the 16 CSFs

	SCALE WEIGHTING EVALUATION															
Increased weight of CSF		**Increased weight Level 1**	**Points allocated**	**Weighted rating**	**Increased weight Level 2**	**Points allocated**	**Weighted rating**	**Increased weight Level 3**	**Points allocated**	**Weighted rating**	**Increased weight Level 4**	**Points allocated**	**Weighted rating**	**Increased weight Level 5**	**Points allocated**	**Weighted rating**
FCS 1	100.00%	0.00%	1	1	25.00%	2	2.50	50.00%	3	4.50	75.00%	4	7.00	100.00%	5	10.00
FCS 2	87.50%	0.00%	1	1	21.88%	2	2.44	43.75%	3	4.31	65.63%	4	6.63	87.50%	5	9.38
FCS 3	81.25%	0.00%	1	1	20.31%	2	2.41	40.63%	3	4.22	60.94%	4	6.44	81.25%	5	9.06
FCS 4	75.00%	0.00%	1	1	18.75%	2	2.38	37.50%	3	4.13	56.25%	4	6.25	75.00%	5	8.75
FCS 5	68.75%	0.00%	1	1	17.19%	2	2.34	34.38%	3	4.03	51.56%	4	6.06	68.75%	5	8.44
FCS 6	62.50%	0.00%	1	1	15.63%	2	2.31	31.25%	3	3.94	46.88%	4	5.88	62.50%	5	8.13
FCS 7	56.25%	0.00%	1	1	14.06%	2	2.28	28.13%	3	3.84	42.19%	4	5.69	56.25%	5	7.81
FCS 8	50.00%	0.00%	1	1	12.50%	2	2.25	25.00%	3	3.75	37.50%	4	5.50	50.00%	5	7.50
FCS 9	43.75%	0.00%	1	1	10.94%	2	2.22	21.88%	3	3.66	32.81%	4	5.31	43.75%	5	7.19
FCS 10	37.50%	0.00%	1	1	9.38%	2	2.19	18.75%	3	3.56	28.13%	4	5.13	37.50%	5	6.88
FCS 11	31.25%	0.00%	1	1	7.81%	2	2.16	15.63%	3	3.47	23.44%	4	4.94	31.25%	5	6.56
FCS 12	25.00%	0.00%	1	1	6.25%	2	2.13	12.50%	3	3.38	18.75%	4	4.75	25.00%	5	6.25
FCS 13	18.75%	0.00%	1	1	4.69%	2	2.09	9.38%	3	3.28	14.06%	4	4.56	18.75%	5	5.94
FCS 14	12.50%	0.00%	1	1	3.13%	2	2.06	6.25%	3	3.19	9.38%	4	4.38	12.50%	5	5.63
FCS 15	6.25%	0.00%	1	1	1.56%	2	2.03	3.13%	3	3.09	4.69%	4	4.19	6.25%	5	5.31
FCS 16	0.00%	0.00%	1	1	0.00%	2	2.00	0.00%	3	3.00	0.00%	4	4.00	0.00%	5	5.00

Source: the authors' own elaboration

Considering the previous definitions, the execution level of each CSF (M_{CSF}) and the readiness level of the HEI (Vnp) is calculated as follows:

The execution level of each CSF:

$$M_{CSF} = N + (N * pn)$$

M_{CSF} = Number of points related to the level of execution of the CSF.

N = Number of points at which the CSF was assessed.

pn = Weight of the level at which the CSF was assessed.

HEI's readiness level:

$$Vnp = \sum_{i=1}^{16} M_{CSF}$$

Vnp = Value of the organization's readiness level
M_{CSF} = Execution level of each of the 16 CSFs

In this way, the HEI's readiness level is identified according to the range of points in the following table.

Table 5 Criterion for assessing HEI's readiness level

Range of points	Readiness Levels
16 – 35 points	N1 - Initial
36 – 55 points	N2 – Repeatable
56 – 76 points	N3 – Defined
77 – 97 points	N4 – Managed
98 – 118 points	N5 - Optimized

Source: Adapted from Paulk, Curtis, Chrissis, & Weber (1993)

In the table above, each qualitative level relative to the HEI's readiness level, can be analyzed as follows:

- N1 – Initial - The implementation of the GDPR has started, without the organization having created and maintained the necessary conditions for this purpose. The implementation process is based on informality and ad-hoc procedures carried out in the units and services. The DPO does not have the necessary visibility in the organization, nor is it involved in all processes where there is a need to ensure that data protection complies with the GDPR. In this state, the organization focuses on the need to demonstrate that it is acting in accordance with the GDPR, without, however, having any practical evidence of this conformity, resulting from security audits.
- N2 – Repeatable - Top management is minimally committed to the implementation process, providing minimal training to workers, facilitating the connection between the units and services with the DPO, temporarily allocating resources to the implementation process, providing communication channels that are not yet comprehensive. There are no comprehensive policies or procedures to ensure information security, nor are the necessary investments made to increase Information Systems and Technologies (ITS) security levels. The organization's culture is still indifferent to information security. The processes and procedures are not fully documented, and do not cover all areas of the organization's business. Data from data processing operations are collected only in some of the most critical units; however, they are not aggregated, shared or used to support decision making.
- N3 – Defined - There is an effective commitment from top management, with respect for the technical autonomy of the DPO that interacts autonomously and regularly with the units and services.
There are minimum resources allocated to the DPO, and workers are provided with training geared to specific situations, with workers focused and aware of the information security practices that they must consider in all situations. The university reviews its security policies and procedures regularly and in accordance with the good practices of an information security management system (ISMS), however, its monitoring is carried out in an ad-hoc manner. Investment in ITS is planned according to cost / benefit. There is a standardized data protection procedure, being communicated to the entire organization, which knows what is expected of it at this level. The processes and procedures necessary for the functioning of the university are documented and critical functions have been assessed. Data from data processing operations are collected electronically, however, their integration is still manual.
- N4 – Managed - Top management has a strong commitment to the implementation of the GDPR, allocating permanent resources and conducting frequent interactions with the DPO, in order to monitor and investigate the status of the process, while respecting the technical independence of the DPO. Training is provided to workers oriented to real and concrete situations where it is necessary to deal with personal data. The protection of personal data is present in the design of processes and in Information Systems (IS) to support the organization's mission. Information security is treated in a centralized manner, with the interaction of users with ITS seen as a vulnerability. The

organization reviews its information security practices in accordance with the recommendations of an ISMS. The need to guarantee the privacy of all stakeholders is no longer seen as a threat, but as a way for the organization to be transparent in the way it deals with personal data. There is a central register of data processing operations in progress in the organization. Security and GDPR compliance audits are carried out on a regular basis by internal experts. There is a strong use of the available communication channels to disseminate information about the GDPR. Data on data processing operations are collected from all units and services and are integrated in real time.

- N5 – Optimized - Top management often interacts with the DPO in order to assess its performance and the state of implementation of the GDPR. Continuous training is available to all workers in order to promote updating and professional development in areas related to data protection. Information security is permanently monitored by operating an ISMS at the university. There is regular investment in ITS, according to well-defined cost-benefit criteria. The confidentiality, integrity and availability of information is guaranteed, with minimal risk to information security. The organization uses the GDPR as a way to mark a distinctive position in relation to the competition, having a culture strongly oriented towards data protection. The process network is regularly reviewed, allowing for continuous improvement of processes, with data protection policies and updated privacy notices, with the process of conducting audits centered on the areas of activity critical to the organization. The recording of data processing operations is performed automatically in all units and services, with data being made available in an integrated manner.

Based on the OAWSP Maturity Model, we can see in Figure 2 below how the execution level of each of the 16 CSFs should evolve. What is expected is that all 16 CSFs have an assessment that allows them to be as much as possible within the cycle.

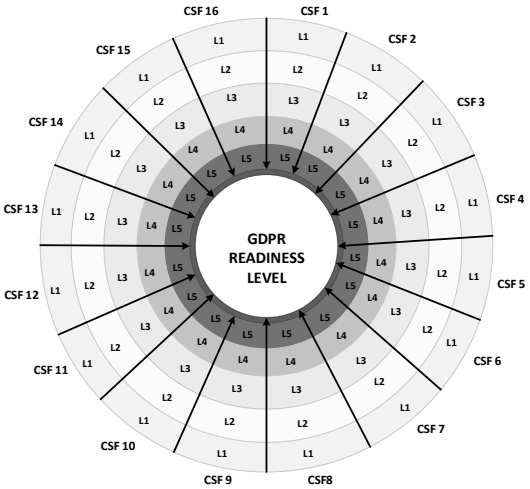

Figure 2 Identification of the readiness level for the GDPR implementation
Source: the authors

Considering that the 16 CSFs are organized in dimensions, it is possible to check the execution level of each of the dimensions: D1 - Human Resources, D2 - Organizational Culture, D3 - Financial, D4 - Processes, D5 - Information Systems and Technologies and D6 - Quality, for the level of readiness of the organization. The following table indicates the weight of each dimension as well as the number of maximum points that it can have, if each of the CSF that compose it is assessed at level 5 with the weighting referred to in Table 4.

Table 6 Weight and maximum number of points by dimension

Organizational Dimensions	Nº of CSFs that are part of the organizational dimension	Relative weight of the organizational dimension (PR_D)	Maximum number of points of the organizational dimension ($NPmax_D$)
Dimension 1 - Human Resources	4 (CSF 1; CSF 2; CSF 3; CSF 13)	25% (4/16)	34,98 (10+9,38+9,06+5,94)
Dimension 2 - Organizational Culture	1 (CSF 4)	6,25% (1/16)	8,75
Dimension 3 – Financial	1 (CSF 12)	6,25% (1/16)	6,25
Dimension 4 – Processes	6 (CSF 7; CSF 8; CSF 9; CSF 10; CSF 14; CSF 16)	37,5% (6/16)	40,00 (7,81+7,5+7,19+6,88+5,63+5)
Dimension 5 - Information Systems and Technologies	3 (CSF 5; CSF 6; CSF 15)	18,75% (3/16)	21,88 (8,44+8,13+5,31)
Dimension 6 – Quality	1 (CSF 11)	6,25% (1/16)	6,56

Source: the authors' own elaboration

The absolute level of execution of each of the Dimensions (NAE_D) is obtained by adding the execution level (M_{CSF}) of the CSFs that compose it, dividing this value by the number of maximum points ($NP_{Max\,(D)}$) that each of the dimensions can have. The following formulas illustrate what has just been mentioned.

$$NAE_{D1}= \frac{M_{FCS(CSF1)}+ M_{CSF(CSF2)}+ M_{CSF(CSF3)}+ M_{CSF(CSF13)}}{NP_{Max\,(D1)}}$$

$$NAE_{D2}= \frac{M_{CSF(CSF4)}}{NP_{Max\,(D2)}}$$

$$NAE_{D3}= \frac{M_{CSF(CSF12)}}{NP_{Max\,(D3)}}$$

$$NAE_{D4}= \frac{M_{CSF(CSF7)}+ M_{CSF(CSF8)}+ M_{CSF(CSF9)}+ M_{CSF(CSF10)}+ M_{CSF(CSF14)}+M_{CSF(CSF16)}}{NP_{Max\,(D4)}}$$

$$NAE_{D5}= \frac{M_{CSF(CSF5)}+ M_{CSF(CSF6)}+ M_{CSF(CSF15)}}{NP_{Max\,(D5)}}$$

$$\boldsymbol{NAE_{D6}= \frac{M_{CSF(CSF11)}}{NP_{Max\,(D6)}}}$$

Considering that each dimension has, as we saw in table 6, a certain relative weight (PR_D), in relation to the other dimensions, it is possible to calculate the relative contribution of execution of each dimension to the level of readiness of the organization. The relative level of execution of each of the Dimensions (NRE_D) is obtained by multiplying the absolute level of execution of each of the Dimensions (NAE_D), by its relative weight ($\boldsymbol{PR_D}$) indicated in the previous table. The following formulas illustrate what has just been mentioned.

$$NRE_{D1}= (NAE_{D1} * PR_{D1})$$
$$NRE_{D2}= (NAE_{D2} * PR_{D2})$$
$$NRE_{D3}= (NAE_{D3} * PR_{D3})$$
$$NRE_{D4}= (NAE_{D4} * PR_{D4})$$
$$NRE_{D5}= (NAE_{D5} * PR_{D5})$$
$$NRE_{D6}= (NAE_{D6} * PR_{D6})$$

The readiness model shown in the following figure (Figure 3) follows the principles listed by Khan, Niazi and Ahmad (2008), fulfilling the requirement of having to be useful for users and having to be simple to use, avoiding the need for complexification.

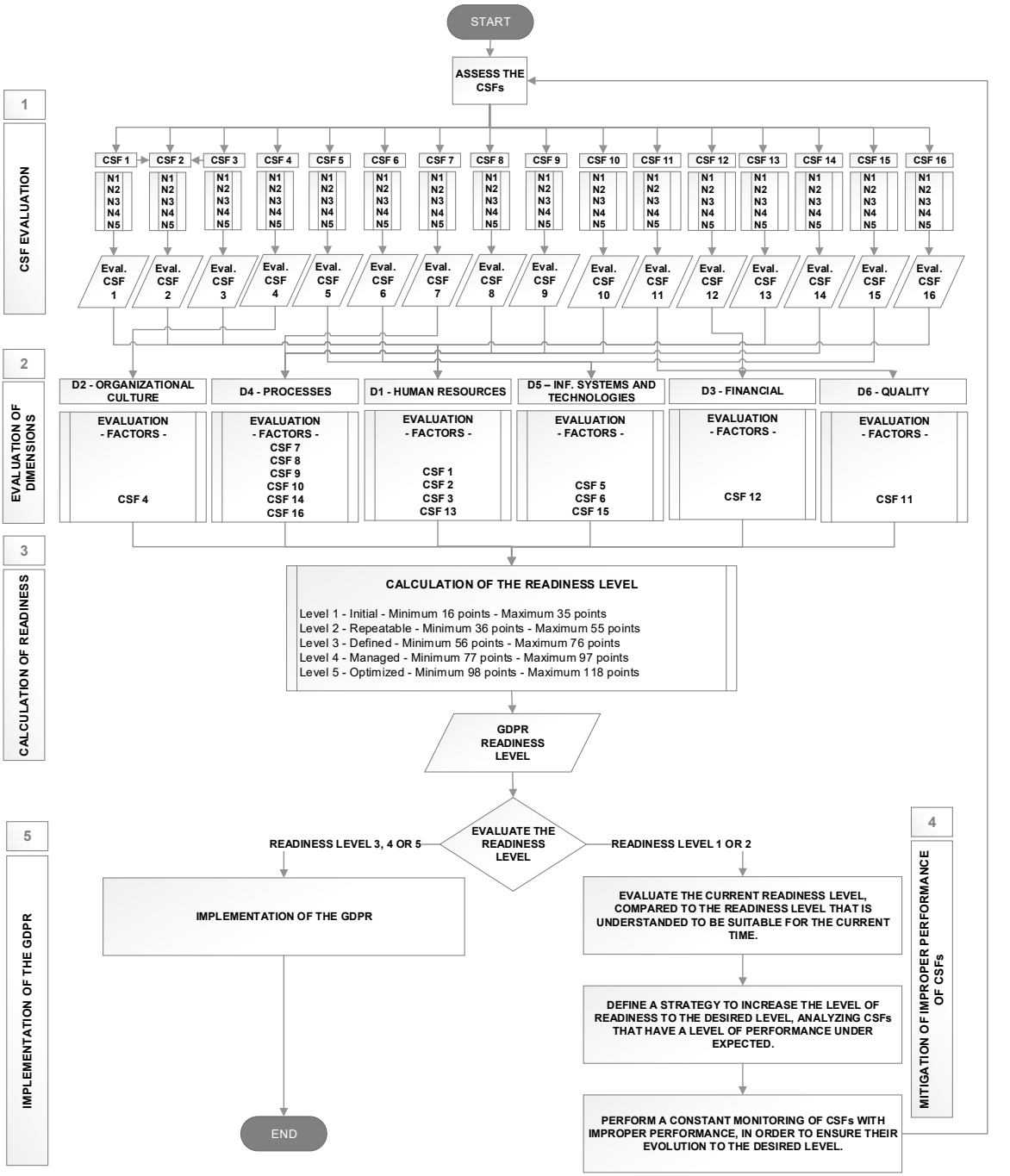

Figure 3 Readiness model proposed for the implementation of GDPR, based on CSFs
Source: the authors

5. Discussion

The readiness model presented in the previous figure (Figure 3) consists of 6 phases. Thus, in the first phase, the performance level of each of the 16 CSFs is assessed individually and sequentially. For this purpose, each CSF must be evaluated using the evaluation structure shown in table 3. This way, we obtain the level of execution (M_CSF) of each of the 16 CSFs. The evaluation of the performance level of each of the 16 CSFs allows knowing which CSFs are performing poorly for the GDPR implementation process, thus allowing HEI managers to make the necessary adjustments at any time.

Then, at the level of organizational functioning, the performance level of the 6 organizational dimensions in the model is assessed - D1 - Human Resources, D2 - Organizational Culture, D3 - Financial, D4 - Processes, D5 - Information Systems and Technologies and D6 - Quality. For this purpose, based on the individual assessment of the 16 CSFs previously carried out, we obtain the absolute (NAE_D) and relative (NRE_D) contribution of each organizational dimension using the formulas identified in the previous section. With this evaluation, it is possible to perceive the organizational dimensions with an inadequate performance level for the process of implementation of the GDPR.

Next, we move on to the third stage of assessing HEI's readiness level for the implementation of the GDPR. The HEI readiness level (Vnp), is obtained by adding the execution level of the 16 CSFs, which, when mapped in the intervals defined in Table 5, allows the identification of the HEI's readiness level for the implementation of the GDPR.

With the achievement of the HEI's level of readiness for the implementation of the GDPR, the model presents two distinct paths. For a readiness level 1 or 2, in a continuous improvement cycle, it is intended that HEI will evaluate the results obtained, and that it will implement the necessary remediation strategies, in order to increase the performance of CSFs that are underperforming. This process must be carried out continuously until it is verified that the HEI's readiness level is already at levels 3, 4 or 5 and in that case, the institution has the conditions to enter the GDPR implementation phase.

The use of this model as a management tool allows HEI to have a broad view of the factors that are critical for the implementation of the GDPR, mapping them into different organizational dimensions, with special emphasis on those that relate to the procedural component, as well as for the management of human resources, as absolutely critical dimensions for the implementation process. On the other hand, it also allows the institution, in moments after the start of the implementation process, to be able, due to the implementation of internal control mechanisms, as well as in the scope of continuous improvement processes, to check the CSFs that may be showing signs decrease in performance. In this way, it is possible to correct and act proactively in these CSFs, avoiding compromising in the medium term the quality of the implementation process already carried out.

Conclusions, limitations and future work

Design Science Research was used, as a research methodology in information systems, to proceed with the design of a model (artifact) of readiness for the implementation of the GDPR in HEIs. The developed model consists of 5 distinct phases. Thus, in phase 1, each of the 16 CSFs is evaluated on a scale with 5 levels of readiness, from 1 to 5, in which level 1 represents the initial or preparatory level of readiness, continuing growing up to level 5 of optimized, where the organization is considered to have the 16 CSFs with a high level of execution.

In phase 2, the dimensions that fit the different CSFs are evaluated, in order to understand the organizational dimensions that need to be worked on better in order to obtain a better performance in the CSF that constitute them. Next, we move on to phase 3, where the organization's readiness level is calculated, measured once again on a scale of 1 to 5, with the organization being classified in each of the different levels, according to the score obtained at the end – between 16 and 35 points at level 1, between 36 and 55 points at level 2, between 56 and 76 points at level 3, between 77 and 97 points at level 4 and between 98 and 118 points at level 5. In phase 4, a mitigation or remediation cycle is carried out for the worst performing CSF, whenever the organization obtains a score that places it at levels 1 or 2. Phase 5 of GDPR implementation is carried out whenever the organization obtains a readiness level of 3,4 or 5.

This model is a practical contribution to the development of the study area related to the implementation of GDPR in HEIs. With this model, HEIs are able to quickly understand, through the analysis of the performance level of the 16 CSFs, which are the organizational areas that need more attention from management, with a possible reinforcement in the allocation of resources and means to the process of implementation of the GDPR. The constant measurement of the CSFs performance level and the consequent calculation of the HEI's readiness level for the GDPR also allows, in the context of a process of continuous improvement, a proactive action to correct aspects that may be degrading the organizational performance in the field of data protection.

This is not an easy task for any medium/large organization, and much less for HEIs, where in a very complex academic culture, thousands of students, professors, researchers and non-teaching

workers interact daily in the most various activities. In this sense, the problem that we propose to solve, with the design and development of a readiness model for the implementation of the GDPR in Universities, involves aspects related to people who deal with personal data every day, within the scope of their functions and roles, making use of a set of skills acquired for this purpose. In addition to people, it also involves the strategy, structures, processes and culture of universities, as well as technology in the form of their infrastructures and applications. In this way, it is considered that the availability of a readiness model will allow knowing the different activities of the HEIs where a reinforcement of resources may be necessary, increasing this the existing knowledge about the performance of the CSFs essential to the implementation of the GDPR.

As a limitation, there is the fact that the model presented has not been tested, therefore it was not possible to comply with steps 4 and 5 of the process model defined by Peffers et al. (2007) for the design of artifacts using the Design Science Research approach.

These two steps are considered for the scope of future work, where they can be carried out by conducting a multiple case study. In that manner, the model can be applied and contributions can be obtained from the HEIs DPOs. These contributions allow the improvement of the readiness model, namely, in the CSFs assessment structure, as well as in the tuning of the intervals related to the 5 levels of readiness in which a given HEI may be.

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Price sensitivity testing as a basic tool for strategic pricing decisions

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Abstract
Background: Data-driven decisions in each functional area of management, through all of the strategic levels, in the present time of dynamic changes in geopolitical and market conditions are necessary to achieve corporate (economic and social) goals, in line with securing future business success and sustainability. Because of this business need, we will focus in our research paper on price management, which can be seen as a supportive tool for strategic decisions, where competent decisions should be based on data-driven pricing decisions.
Purpose: The aim of the research study is to identify what price consumers are prepared to pay for a new food product in a relatively saturated foreign market. The research study was conducted in the milk chocolate bar market segment.
Study design: We applied the van Westendorp price sensitivity test to identify the range of acceptable prices for a product that is willing to enter a new foreign market. For this purpose, we used a milk chocolate bar product currently unknown in the Slovak market.
Findings: In addition to the van Westendorp price sensitivity measurement, we used a non-parametric Mann Whitney U test to confirm the hypothesis that chocolate tasting will increase the likelihood of customers to pay a higher price for the tested product. The hypothesis mentioned above was statistically confirmed.
Limitations: It is necessary to monitor customer reactions to a given price level and be prepared to optimize it. We did not address this part of the analysis in identifying a price that would be acceptable to consumers in terms of value perception, due to the scope of the study.

Keywords
strategic decisions; pricing; price sensitivity; van Westendorp price sensitivity measurement; reference price

Introduction

Chocolate production has a long history in Slovakia (the first factory was established in 1896). The turnover of the cocoa and chocolate manufacturing industry in Slovakia increased by 13 million euros in 2019, adding it up to the total turnover amount of 132 million euros in 2019 (Statista, 2019). Since 2017, we have seen a growing trend in the chocolate industry. Total consumption of chocolate and chocolate confectionery in Slovakia only in 2020 fell by an average of 900 grams (20.9%) per capita (Datacube, 2022). According to the final data of the Slovak Statistical Office, each Slovak ate 3.4 kg of chocolate confectionery, while the year before it

was 4.3 kg. The highest per capita consumption of chocolate was achieved in Slovakia in 2007, 2012 and 2014, when each citizen, regardless of age, consumed on average between 5.1 and 5.4 kg of chocolate or chocolate confectionery per year. Considering the rich history of chocolate and chocolate confectionery production in Slovakia and at the same time its popularity in consumption, which is also documented by the above short statistical overview, we decided to test the price sensitivity of chocolate consumers on a selected sample of respondents to acquire information about the acceptable consumer price for a 100 g pack of chocolate.

Setting the right price for the products is an application skill that every price and revenue manager should possess. According to the marketing researchers (Chhabra, 2014; Voros, 2019; Lipovetsky, Magnan & Zanetti-Polzi, 2011) the pricing decision is a substantial component of the marketing mix, and the price is the one that has a significant impact on customer loyalty and serves as a means of expressing quality (Makasi & Govender, 2014; Rao, 2005; Feenstra & Romalis, 2014).

The pricing process consists of activities such as obtaining and preparing price-relevant data, creating an institutionalized pricing process, pricing decision making, and the concept of systematic price adjustment, with the aim of creating an optimal price-setting process (Sato, 2019; Dutta, Zbaracki & Bergen, 2003). The determination of the specific price of a product must not only consider the costs of the business (Farm, 2020), but must also ensure its profitability (Balcıõglu & Varol, 2022; Liozu & Hinterhuber, 2021). According to the pricing theory, four different approaches and their combinations can be applied in the pricing process – cost-based oriented, demand-oriented, competition-oriented, value-based oriented and their combinations (Smith, 2012; Schindler, Parsa & Naipaul, 2011; Bickhoff, Hollensen, & Opresnik, 2014). Although the most widely used approach is the cost-based pricing, it does not allow companies to achieve the top line revenue growth strategies (Mattos, Oyadomari & Zatta, 2021; Nejad, 2013; Krämer & Schmutz, 2020; Guerreiro & Amaral, 2018). Despite the fact that several authors have documented the existing positive relationship between value-based pricing and company performance (Liozu, 2017; Huefner, 2017; Provines, 2017), this pricing approach is scarcely used and is not widespread in corporate practice (Steinbrenner & Turčínková, 2021). Value driven approach is based on defining and calculating the value customers' experience as a utility from a product (Jing & Lewis, 2011; Smith & Colgate, 2007). Utility is defined in microeconomic theory as the level of satisfaction a consumer gains from consuming a unit of a product (Besanko, Braeutigam & Gibbs, 2020). Depending on the volume of consumed units, utility increases, but the increments of utility, i.e., the consumer's satisfaction rates from the consumption realized, gradually decrease as consumption increases. This phenomenon is called diminishing marginal utility in micro-economic theory (Martin, 2019).

1. Literature review

The topic of consumer price sensitivity to a particular product category can be analysed from several perspectives. From a managerial perspective, we talk about the so-called price sensitivity, which is affected by many factors such as the level of purchase involvement, bundled discounts, and brand loyalty (Dominique-Ferreira, Vasconcelos & Proença, 2016; Arce-Urriza, & Cebollada, 2009; Pir & Derinozlu, 2020), age and gender (Valjaskova, Kral & Kliestikova, 2020), or consumer's local identity (Gao, Zhang & Mittal, 2017). Customer acceptance of bundled discounts has been strongly influenced by brand loyalty.

The price sensitivity of the consumer has always been a worldwide phenomenon addressed by marketing managers as well as researchers (van Westendorp, 1976; Slaba, 2021; Sathyanarayana & Heydt, 2013). This construct expresses the economic perception of a product value, perceived by customers, which can be considered as the fences of customer segments (Munnuka, 2005; Kim, Blattberg & Rossi, 1995; Sendegeya, Lugujjo, Da Silva, Soderc & Amelin, 2009; Nicolau, 2009; Salamandic, Alijosiene & Gudonaviciene, 2014; Wakefield & Inman, 2003). It also affects consumer decision-making, from the perspective of the probability, what price they are willing to pay for a premium or innovative product (Zheng, Li, Fang & Zhang, 2021). The price sensitivity measurement has been a common approach to defining consumers' willingness-to-pay and assessing their knowledge about price (Salamandic et al., 2014; Danes & Lindsey-Mullikin, 2012). Nevertheless, it has faced criticism regarding its mathematical interpretation as well as its usefulness in brand management. From another point of view price sensitivity can be seen as a level at which and how consumer

behaviour can be influenced by the price of a product or service (Goldsmith & Newell, 1997; Mauricio, Deliza & Nassu, 2022).

The van Westendorp model as a frequently used tool for determining price sensitivity, provides estimates of the range of acceptable prices that potential buyers would be willing to pay by defining the upper and lower price level (Harmon, Unni & Anderson, 2007). It also refers to the difference between the point of marginal cheapness and the point of marginal expansion. This means how far a product's sales can be affected by price (Hartono, Salendu & Gatari, 2020).

According to the realised research, lower-income customers were more price-sensitive than higher-income ones (Hsieh & Chang, 2004). This would imply systematic differences in consumers' reactions to prices across formats and emphasizes the importance of a properly implemented price strategy and pricing in the company.

Equally important is the perception of customer preferences in terms of value, which is expressed through the customer's cognitive responses (Harmon et al., 2007). The buyer's tendency is to compare a product's value with that of a reference product. This cognitive process results in the recall of subconsciously stored information about the value called the reference price (Lastner, Fennell, Folse, Rice & Porter, 2019; Chandrashekaran, 2011; Zhang & Chiang, 2020). This refers to a price that a consumer thinks of as an appropriate price for the product (Lewis & Shoemaker, 1997).

If the buyer perceives the price to be too high compared to the utility achieved, this results in a rapid decline in demand (Harmon et al., 2007).

The simple and low-cost applicability of the Van Westendorp price sensitivity model for food products has been demonstrated by several studies (Weinrich & Gassler, 2021; Ghali-Zinoubi & Toukabri, 2019; Anastasiou, Anastasiou, Keramitsoglou, Kalogeras, Tsagkaraki, Kalatzi & Tsagarakis 2017). Authors Stolz, Stolze, Hamm, Janssen and Ruto (2011) emphasized that organic food marketing should consider the price sensitivity of parts of occasional organic consumers and increase the perceived price-performance ratio of organic products communicating quality attributes. According to Scholz and Kulko (2022), freshness largely determines consumers' willingness to pay and price sensitivity. The use of the price sensitivity tool in price management brings for the pricing of a perishable product, which food products are, considerable positives.

2. Methods

The aim of our research study was to determine the price interval of a new food product (milk chocolate bar), which is not yet available on the Slovak market. By means of a price sensitivity test (van Westendorp price sensitivity test) we found out what price consumers would be willing to accept a new food product in our relatively new market segment of milk chocolate bars. For the purpose of the research study, we used a product unknown on the market in the country (Slovakia), coming from another country within a group of the countries of the European Union (Austria Hauswirth).

The price of the Hauswirth milk chocolate bar was compared with the following brands of milk chocolate bars – Lindt, Figaro, Ritter Sport, and with traditional Slovak milk chocolate Deva. Four competing products were visually presented to the respondents, with the intention of recalling the internal reference price, which is basically based on the past prices paid for the brand (Kumar, Hurley, Karande & Reinartz, 1998; Peschel, Zielke & Scholderer, 2022). In the following step, a group of respondents was asked to taste the chocolate, providing a framework for the external reference information (Nieto-García, Muñoz-Gallego & González-Benito, 2017; Zimri, Zamri & Aziz, 2012).

The original research sample (N = 372 respondents) consists of people (male N= 164; Female N= 208), aged 20 to 25. The respondents come from different regions of Slovakia (western, southern, central, northern, and eastern). The researchers ensured the objectivity of the measurement by using electronic data collection instruments to avoid influencing participants. The participants were briefed in writing by one researcher. Then, a statistical sample was randomly generated in the STATA software. We analysed consumer preferences at different price levels of a product using van Westendorp Price Sensitivity Meter (van Westendorp, 1976; Ceylana, Koseb & Aydin, 2014), which allows us to identify what price a consumer is willing to pay for a product. The above test is used to anticipate the expected value of a product and its usefulness to the consumer based on price perceptions of fairness and convenience of the purchase activity. The aim of the test was to identify the limit prices of the product that, on the one hand, motivate the consumer to undertake a purchase activity and, on the other hand, discourage him from undertaking a purchase activity.

The test itself consists of the following questions (Weinrich & Gassler, 2021):

- At what price would you consider the product so expensive that you would decide not to buy it? The product and service are too expensive;
- At what price would you start to doubt the quality of the product? The product and service are too cheap;
- At what price would you consider the product expensive but would still be willing to consider buying it? The product and service are expensive, it represents the upper limit of the price;
- At what price would you consider the product a bargain? The product and service are cheap, it represents the lower limit of the price (Stelick, Sogari, Rodolfi, Dando & Paciulli, 2021).

The result of the application of the van Westendorp price sensitivity test is a price interval ensuring that the price of the product or product innovation is set at a level acceptable to the consumer and thus achieving the desired sales volume and revenue. By applying the price sensitivity test, a company can identify the price levels listed below – point of marginal cheapness (PMC), point of marginal expensiveness (PME), optimal price point (OPP), indifference price point (IPP) and the range of acceptable prices (RAI) (Lewis & Shoemaker, 1997; Raab, Mayer, Kim, & Shoemaker, 2009).

The point of marginal cheapness reflects the price level at which the reduction in sales volume and revenue caused by the deterioration in the quality of the product and service is not offset by an increase in the sales volume of the product and service by consumers who consider this price level to be a bargain purchase.

The point of marginal expensiveness reflects the price level of a product and service that consumers consider to be unreasonable in relation to the perceived value or expected level of the cost of creating the product and providing the service.

The optimal price point expresses the price level for which the equilibrium consumer perception of the product as cheap and expensive at the same time holds. In this sense, a numerically equal group of consumers consider the product demanded to be too ex-pensive and an equally numerically large group of consumers consider the price of the product to be too cheap.

Indifference price point reflects numerically equally sized groups of consumers who, on the one hand, think that the product is expensive and, on the other hand, consider the demanded product to be cheap. In terms of consumer perception, it is a purchase activity that matches the consumer's expectations in terms of value and that the consumer evaluates as relevant and successful. Empirical analysis has shown that the indifference price (IDP) (Çolak & Koşan, 2021), which presents either the median price paid by consumers, or the price of the product of a market leader, can vary for various sub-markets as price-conscious customers (people who buy cheap products and people who buy expensive products and brands). A general price anchoring point in a market exists and many people who buy more expensive brands or product types are fully conscious of doing so (van Westendorp, 1976).

The range of acceptable prices represents all prices that are acceptable to consumers (Harmon et al., 2007). Beyond its boundaries are the extremes where, on the one hand, consumers perceive a product to be so cheap that they would not buy it themselves, or, on the other hand, so expensive that they would not undertake purchasing activity anyway.

The indisputable advantage of this method is its simplicity, variability, and the possibility of linking it to other types of research tasks. On the other hand, the main disadvantage of the application of the test can be considered as the fact that it determines the price of each product in isolation, i.e., without interaction with competing products. For this reason, we extended the van Westendorp test to include another test criterion in the experiment, namely the gender of the respondents. At the same time, we set the testing in a situation where we provided respondents with frames of reference (Florack, Egger & Hübner, 2020; Teskey & Masson, 2017). The first frame of reference was competitive best-selling milk chocolates on the Slovak market, which were visually presented. Another parameter that influences customers' purchasing behaviour is the taste of the product, in this case the taste of Hauswirth milk chocolate bar (Szolnoki, Hoffmann & Herrmann, 2011). By tasting the tested chocolate, we established another frame of reference.

In the research process, measurement accuracy (objectivity) was ensured through electronic data collection tools to avoid influencing the research subject (Auerbach & Silverstein, 2003). Subsequently, the validity and reliability of the

questionnaire were tested (Jones et al., 2015; Kennedy, Kichler, Seabrook, Matthews & Dworatzek, 2019). The Cronbach's alpha was used to measure the internal consistency of the questionnaire's items among the respondents. The value alpha= 0.71 was obtained for a sample of 372 respondents. This value represents a marginal level of internal consistency (Leong & Austin, 2006).

Table 1 Reliability of the price sensitivity test

Cronbach's Alpha	*Number of items*
.71	5

Source: the authors

Afterwards, we observed systematic differences among the responses of the participants, who tasted the milk chocolate and those who did not, in the variable Price. The following hypotheses were tested:

H1: Respondents who tasted the chocolate are willing to pay a statistically significant higher price for this chocolate than respondents who did not taste the chocolate.

H0: There is no statistically significant difference between the two groups (tasted or without tasting) in willingness to pay. A non-parametric test, the Mann-Whitney U test, was applied to confirm the hypothesis that if the two groups have the same mean. To express the strength of the above-mentioned divergence we applied the statistical parameter effect size designed for the Mann Whitney U test, which can be calculated as follows (Mann & Whitney, 1947):

$$r = \frac{Z}{\sqrt{N}}$$

The acquired data were cleaned and statistically analysed using the STATA statistical software. Hypotheses were tested at a significance level of $\alpha \leq 0.05$.

3. Results and discussion

We decided to apply the van Westendorp price sensitivity test and demonstrate its importance and use in value-based pricing by setting a price of a new product line of milk chocolate bar, which is currently not available on the domestic (surveyed) market. The focus of the research experiment is to acquire information on the price sensitivity of customers for the product in a saturated market segment. Four price levels were observed in the research survey.

Table 2 Descriptive table for price levels (in euro)

Variable	*N*	*Mean*	*Std Dev*	*Variance*	*Kurtosis*	*Skewness*	*Min*	*Max*	IQR	*Median*
tooExpensive	372	2.73	1.79	3.21	8.14	2.03	.70	10.00	1.5	2.245
tooCheap	372	.53	.266	.071	10.48	2.06	.00	2.00	.21	.50
Expensive	372	1.76	.99	.99	11.03	2.01	.50	9.00	1.08	1.50
Cheap	372	.95	.44	.19	6.08	1.59	.20	3.00	.34	.90

Source: the authors

Based on the descriptive statistical results we can say that the average price point of the milk chocolate bar Hauswirth perceived by respondents as "too Expensive" is M = 2.73 (with variability SD=1.79). The minimum price the consumers are willing to pay in this price level is 0.70 euros; on the other side, the maximum price for milk chocolate will be stopped on the price level of 10.00 euros. The average "Expensive" price, which represents a realistic purchase, reached the value of M= 1.76 euros (SD= .99) and the price interval is in the range of Min= 0.50 euros to Max = 9.00 euros. The average price of the milk chocolate perceived as "Cheap" (M = .95, SD = .44) and "too Cheap" (M = .53, SD = .266) did not exceed 1 euro. Respondents who perceived the price of chocolate as "Cheap" and therefore a bargain would pay a maximum price of 3 euros. Ideally, it should be 20 cents. Respondents who perceived the price of the chocolate bar as suspiciously cheap ("too Cheap") to the extent that they distrusted its quality would pay a maximum of 2 euros.

The monitored statistical sample shows the highest positive value of the skewness in the variable price "too Cheap" (Skewness =2.06), which provides the information on a larger representation of respondents with lower values of this price level. There are also more respondents with a lower value of perceived price level as "Cheap" (Skewness = 1.59). Then we can say that examined data represent a substantially skewed distribution. Based on the data about kurtosis, we found how the values of the variables are concentrated around the average. The price level "Cheap" shows the lowest positive value for the kurtosis coefficient (γ = 6.08), which refers to the leptokurtic, what means

that there are more chances of outliers. In addition, the price level "Expensive" shows the same tendency ($\gamma = 11.03$). Both price levels "too Cheap" ($\gamma = 10.48$) and price level "too Expensive" ($\gamma = 8.14$) are also positive, giving a clear concentration around the average, although with different variability.

The van Westendorp price sensitivity measurement was applied to identify the range of acceptable prices that would meet consumer expectations in terms of target orientation with respect to the quality of milk chocolate and is capable to determine the market price of the product in our market segment. Respondents were asked the following open-ended questions:

- At what price would you consider Hauswirth chocolate a bargain? (cheap)
- At what price would you consider Hauswirth chocolate so expensive that you would decide not to buy it? (too expensive)
- At what price would you start to doubt the quality of Hauswirth chocolate? (too cheap)
- At what price would you consider Hauswirth chocolate expensive, but you would still be willing to consider buying it? (expensive) (Tarne, Lehmann & Kantner, 2019; Diamantopoulos, Matarazzo, Montanari & Petrychenko, 2021).

In the figure below, we present the results of the measured values from the survey, which allow us to identify and describe the consumer's perception of sensitivity to a change in the price of the product (Thomadsen, Rooderkerk & Amir, 2018). The range of acceptable prices represented by the four price levels is indicated graphically by the black line, the "tooCheap" and "Cheap" price curves at the intersections with the "Expensive" and "tooExpensive" curves form the boundaries of the interval of acceptable prices.

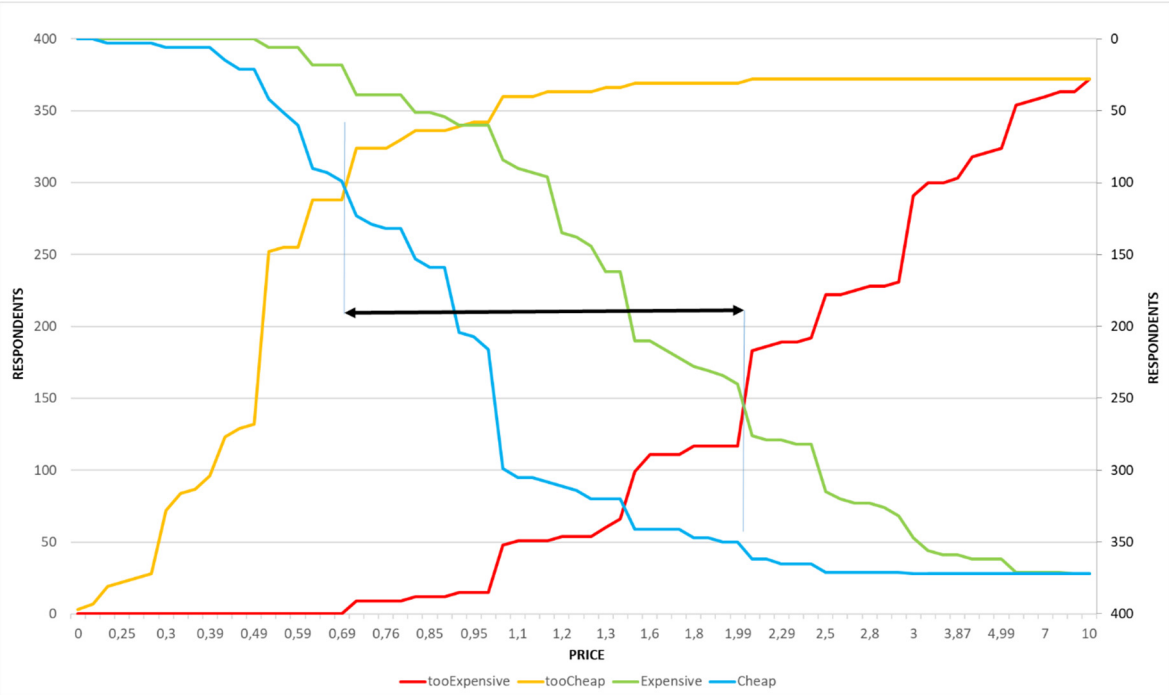

Figure 1 The range of acceptable prices (in euro)
Source: the authors

The yellow curve in the figure above represents the price levels for which respondents considered Hauswirth milk chocolate bar so cheap that they would refuse to buy it because they doubted its quality. Potential customers would opt for an available competing product or might delay their purchase decisions because they would doubt the quality of the chocolate at a given price level. As can be seen from the figure above, all customers consider the marginal price of Hauswirth milk chocolate bar to be 0.00 euros. This fact means that none of the respondents would be willing to consume Hauswirth chocolate bar even if it was offered free of charge. Of all the respondents, only 0.81% would still consider a price of 0.10 euros to be acceptable; all the others would no longer buy this type of milk chocolate bar for the reasons presented above. On the other hand, at a price

increase of 0.39 euros, about a quarter of all respondents, i.e. 25.81 %, answered that they would consider the tested type of chocolate bar so cheap that they would refuse to buy it. The cut-off price at which no consumer would consider Hauswirth milk chocolate bar to be inadequately cheap is 0.69 euros.

The blue curve represents the price levels for which consumers consider buying Hauswirth milk chocolate bar to be a bargain purchase. The consumer perceives the realisation of the purchase decision in the form of obtaining additional satisfaction. Satisfaction is formed by the positive expected differential value that the consumer perceives with respect to the price of the reference product. Thus, a positive disparity is created between the consumer's expectations and the reality of what he or she receives by buying Hauswirth milk chocolate bar for a particular price level. The consumer's perception of a positive differential value with respect to the product purchased creates the prerequisite for customer loyalty.

The analysis of the measured values presented in Figure 1 shows that all respondents perceive the price of Hauswirth milk chocolate bar at 0.00 euros to be cheap. Gradually as the price increases, for example at a price of 0.50 euros, approximately 88.71% of the respondents consider the product to be cheap, i.e. the price to be paid by the consumer for this product is still considered to be a bargain compared to the competing products available. On the other hand, for 1.50 euros for milk chocolate bar, only 8.33 % of the respondents consider this price level to be a bargain. Thus, a purchase that brings a positive differentiation effect to the consumer. The threshold price before identifying the positive differentiation effect obtained by buying Hauswirth milk chocolate bar is the price at 1.40 euros. At this price, 13.98 % of the respondents evaluate the purchase of chocolate bar as profitable, i.e. with a potential gain for the consumer. From a price of 1.40 euros, none of the consumers surveyed would rate the purchase of Hauswirth milk chocolate bar as a bargain purchase, i.e. a purchase with a positive impact on the consumer.

The green curve in the figure presented above indicates the price level for which respondents considered the price of Hauswirth milk chocolate bar to be expensive. The expression expensive does not depict a situation where consumers reject the product because of its high price but indicates that consumers perceive a negative differentiation value. We interpret this fact to mean that the consumer considers the price he must pay with respect to the available competing products to be disproportionate compared to the effect he obtains by carrying out the purchase activity. We say that the consumer's expectations and assumptions did not met with the reality given by the market and the price of the tested product on the market. The disparity between expectations and reality may be so strong that the company may not be successful in penetrating the market. The negative perception of inadequate and unfair pricing of the product by the customer may be so significant that he decides not to undertake purchasing activity, which will negatively affect the sales and the bottom line of the company in question.

The analysis of the measured values shows that all respondents consider the sale of Hauswirth milk chocolate bar for more than 8.00 euros to be expensive. On the other hand, if the tested chocolate bar sample cost less than 2.00 euros, all respondents of the implemented questionnaire survey would not consider it expensive. Based on the above, we assume that they would consider Hauswirth milk chocolate bar as cheap or too cheap. Gradually, as the price drops, for example at a price of 1.70 euros, approximately 40.32 % of the respondents surveyed do not consider the tested product to be expensive. These consumers perceive that the type of product mentioned corresponds to the price set by the market or the company offering the product. The group of consumers identified above consider this price to be reasonable in view of the satisfaction effect obtained. On the other hand, at a price of 2.50 euros for Hauswirth milk chocolate bar, only 15.32 % of the respondents consider this price level to be reasonable, 84.68 % of them consider the price to be unreasonable, i.e. expensive. Despite this fact consumers are considering buying the tested product. The threshold price before the identification of a negative differentiation effect is the price at the level of 2.00 euros. At this price, only about a quarter of the respondents, i.e. 25.81% of them evaluate such a purchase as reasonable. At a price exceeding 2.00 euros, none of the customers would probably be willing to pay and carry out the purchase activity of Hauswirth milk chocolate bar.

The last criterion evaluated was the price, which is unacceptable from the consumer's point of view for Hauswirth milk chocolate bar. In the figure above, these price levels are represented by the red curve. The price at which consumers consider Hauswirth milk chocolate bar to be

unreasonably expensive is 10.00 euros. At this price none of the respondents would be willing to pay the price for this product, so this price sales would reach zero (Peschel et al., 2022). This price level represents a prohibitive price of the demand.

Before gaining a deeper insight into the respondents' perception of the product, we introduced a frame of reference in the testing, which was a taste of the tested chocolate bar. The aim was to determine whether the taste of milk chocolate bar could be a good differentiator for higher or lower price sensitivity. The first group has tasted milk chocolate bar, the second did not.

Systematic differences among respondents were analysed through the non - parametric testing of the Mann Whitney U test. The selection of the applied test was conditional on meeting the conditions for the use of parametric tests. The variable on which the two groups were compared is an interval. Simultaneously, independence of measurement was ensured as described in the research design. The Kolmogorov-Smirnov test was used to test the data distribution normality.

Table 3 Kolmogorov-Smirnov test for prices

		tooExpensive	*tooCheap*	*Expensive*	*Cheap*
N		*372*	*372*	*372*	*372*
Most Extreme Differences	*Absolute*	.25	.24	.27	.30
	Positive	.25	.24	.25	.30
	Negative	-.16	-.19	-.27	-.17
Kolmogorov-Smirnov Z		5.10	4.96	5.54	6.20
Asymp. Sig. (2-tailed)		.000	.000	.000	.000

Source: the authors

The significance level of the p-value for all interval parameters of price is lower than .05, meaning that the test is statistically significant and so the assumption of normally distributed data is disrupted (Remenova & Jankelova, 2019). As the p-values obtained from Levene's test is significant ($p < 0.05$), we conclude that the data is not normally distributed. Therefore, Mann-Whitney U test is appropriate for analysing our two samples. The Shapiro-Wilk W test, based on the assumption of data normality, confirmed the same results (Cheap (W=.611, p-value = .000), Expensive (W=.37, p-value = .000), too Cheap (W=.50, p-value = .000), too Expensive (W=.76, p-value = .000)).

The results of both tests indicated a violation of the conditions for parametric testing, so we used the non-parametric Mann Whitney U test to find out the difference between the two groups of respondents. We were interested in whether respondents who tasted the milk chocolate bar are willing to pay a higher price for this chocolate than respondents who did not taste it. The following hypotheses were tested:

H_1: Respondents who tasted the chocolate are willing to pay a statistically significant higher price for this chocolate than respondents who did not taste the chocolate.

H_0: There is no statistically significant difference between the two groups (tasted or without tasting) in willingness to pay.

In the following tables, we present results for two groups. Group 1 represents those who had tested the chocolate bar. Group 2 consists of those respondents who did not taste chocolate bar.

Table 4 Ranks and Test Statistics for Price "Cheap" by Taste of chocolate bar

Variable taste of chocolate bar	**OBS**	**Rank sum**	**Adj. variance**	**Mean**	**Median**	**Z**	**p-value**	**Effect size**
group 1 - yes	272	51688.5		.95	.9			
group 2 - no	100	17689.5		.95	.9			
total	372	69378	833349.43	.95	.9	1.05	.29	-

Source: the authors

On average, the respondents' group no. 2, which did not taste the chocolate would pay the same, "Cheap" price (M = .95) for our product as the group no. 1, - those who have tasted the chocolate bar (M = .95). At the average price value "Cheap" M = .95 the variation range showed a

value of 2.8 with the lowest value of 0.2 euros. Within the range of values in this price category, we were interested in the value of the interquartile range, which was IQR = .34. The quartile deviation and the coefficient of quartile deviation were also analysed to define the absolute and relative measures of dispersion (QD = .17; CQD = .204). We were also interested in the value of the Mode of each of the four price categories under study. Respondents in the "Cheap" category were most likely to pay 1 euro for milk chocolate bar (Mode = 1).

Despite the higher average price, the mean of group no. 1 is not statistically significantly higher than of group no. 2. Based on the results of non-parametric testing, we reject the alternative hypothesis and accept the null hypothesis because the respondents who have tasted the chocolate are not willing to pay a statistically significant higher price for this chocolate bar (p >.001) than those who did not taste it.

Table 5 Ranks and Test Statistics for Price "tooCheap" by Taste of chocolate bar

Variable taste of chocolate bar	Obs	Rank sum	Adj. variance	Mean	Median	Z	p value	Effect Size
group no. 1 - yes	272	52691		.55	.5			
group no. 2 - no	100	16687		.48	.5			
total	372	69378	813831.88	.53		2.176	.0296	**.112**

Source: the authors

As it turned out from the second price level analysis, the respondents' group no. 2, who did not taste the chocolate bar, would pay a lower price (M = .48) in the price category "too Cheap" for our product than group no. 1 (M = .55). Therefore, we can confirm that the mean of group no. 1 is statistically significantly higher than of group no. 2 (p-value =.0296). Based on the results of non-parametric testing, we reject the null hypothesis and accept the alternative hypothesis because the respondents who did not taste the chocolate bar are willing to pay a lower price for this chocolate bar than those who have tasted it. The strength of the difference has been calculated using the effect size (ES) formula, which determines the degree of association between the groups. According to Cohen (1988), our results of ES = .112 reports weak association.

The variance margin of the price category 'too cheap' showed a value of 2 at zero lowest value, while the average price of milk chocolate in this category was M = .53. Within the range of values in this "too Cheap" price category, we were interested in the Interquartile range, which reached the level of IQR = .21. The quartile deviation and the coefficient of quartile deviation were also analysed to define the absolute and relative measures of dispersion (QD = .105; CQD = .21). We also looked at the amount paid for milk chocolate bar by respondents in the "tooCheap" category. Most often it was fifty cents (Mode = .50).

Table 6 Ranks and Test Statistics for Price "Expensive" by Taste of chocolate bar

Variable taste of chocolate bar	Obs	Rank sum	Adj. variance	Mean	Median	Z	p value	Effect size
group no. 1 - yes	272	52534.5		1.81	1.5			
group no. 2 - no	100	16843.5		1.64	1.3			
total	372	69378	840675.35	1.76		1.970	.048	**.102**

Source: the authors

The price category labelled as "Expensive" had a higher mean value of 17 cents for respondents who have tasted chocolate bar (M= 1.81). The mean for group no. 1 is statistically significantly higher than for group no. 2. Therefore, based on the results of non-parametric testing, we reject the null hypothesis and accept the alternative hypothesis because there is statistically significant difference

between those two groups according to the price level.

At the mean value of the price "Expensive" M = 1.76, the variation margin showed a value of 8.5 at the lowest value of this price level, which is fifty cents. Because of the high variation margin, we calculated the Interquartile range, which for the "Expensive" price level was IQR =1.108. The Quartile Deviation and Coefficient of Quartile Deviation were also analysed in order to define the absolute and relative measure of dispersion (QD = .55; CQD= .32). For the price category "too Expensive", respondents reported that they most frequently would pay 1.5 euros for milk chocolate bar (Mode = 1.5)

Table 7 Ranks and Test Statistics for Price "too Expensive" by Taste of chocolate bar

Variable taste of chocolate bar	Obs	Rank sum	Adj. variance	Mean	Median	Z	p value	Effect Size
group no. 1 - yes	272	53071		2.91	2.5			
group no. 2 - no	100	16307		2.2	2			
total	372	69378	834998.73	2.73	2.245	2.56	.01	**.132**

Source: the authors

Even for the price level marked "tooExpensive" respondents who have tasted chocolate bar would be willing to pay a higher price. Respondents without the option of tasting chocolate bar would on average pay 71 cents less for chocolate bar (M=2.2) than those who have opportunity to taste the chocolate (M=2.91). At the mean value of the "too Expensive" price level M = 2.73, the variance range showed a value of 9.3 at the lowest value of this price level Min = .70 euros. Due to the high variation range, we have calculated the Interquartile range, at the price level "too Expensive" the IQR was =1.5. Quartile deviation and quartile deviation coefficient were also analysed to define absolute and relative measures of dispersion (QD = .75; CQD = .33). For the price category "too Expensive", respondents stated that the most frequently paid price for a milk chocolate bar was Mode = 2 euros.

The mean for group no. 1 is statistically significantly higher than for group no. 2. Based on the results of non-parametric testing, we reject the null hypothesis and accept the alternative hypothesis because there is statistically significant difference between those two groups according to the price level (p =.01).

Conclusion

The objective of the research study was to highlight price levels and other factors that influence the consumer's purchase decisions. One such key factor is just the internal reference price of each respondent, which is based on the purchase already made in the past. An equally important factor is the perception of the taste of the product. We have incorporated the key frames of reference into the study to gain deeper insights into the reasons for consumer decision making for a particular food product. At the same time, we highlighted the economic benefits of the frames of reference when testing the van Westendorp model. As the results of the analytical part of the study show, using the above price sensitivity test, we have identified a range of acceptable prices for a new food product based on customer perceived value. The price curves shown in Figure 1 "tooCheap" and "Cheap" at the intersections with the "Expensive" and "tooExpensive" curves form the boundaries of the range of acceptable prices.

The lower boundary price of the interval is the price that is the intersection of the "tooCheap" and "Cheap" curves. On the other hand, the marginal price of the upper part of the interval is the price that is the intersection of the “tooExpensive” and “Expensive” curves. At this price, consumers are not willing to accept a higher price. The price levels between these two marginal prices are evaluated by consumers as acceptable. For Hauswirth's new product milk chocolate bar, this range of acceptable prices is <0.69; 2.00> euros. The optimal price level is 0.99 euros.

The median value of each price level divided our respondents into equally sized groups. For the Price "tooCheap" category, half of the respondents would pay more than fifty cents; for the Price "Cheap" category, they would pay up to .90 euros. For the price category "Expensive", half of the respondents would not pay more than 1.50 euros for a Hauswirth milk chocolate bar. Within the last price level "tooExpensive", the category median was 2.245 euros.

As part of the study, we also investigated the effect of the frame of reference on respondents'

willingness to pay a higher price for the product if there will be opportunity to taste the product (chocolate bar). Chocolate taste possibility was applied as the reference frame. Respondents from the test group no. 1 were offered chocolate directly during testing. A bar of chocolate was opened directly in front of them so that they could smell and taste it. Through a non-parametric Mann Whitney U test of the difference in means of the 2 groups, we investigated whether the group that tasted the chocolate would pay a higher price than the group that did not taste it. The hypothesis was confirmed.

Managerial implication

From the managerial point of view, it is important to know which factors influence consumer behavior and to what extent. As presented and confirmed in this study, the key roles are played by customers` internal reference prices and the possibility to taste the product (milk chocolate bar). Outcomes of our research confirm that the use of analytical tools for the analysis of consumer behavior gives the company's management foundations for setting an appropriate pricing strategy that ensures higher revenues and profit. It also provides an answer to strategic questions about the appropriate level of price range a product entering an almost saturated foreign market.

Limitation of the study

To determine the price of milk chocolate bar, we applied a value-based pricing approach using the van Westendorp test, which provides an economic expression of the perceived value of the product to the consumer (Johansson & Andersson, 2012). The indisputable advantage of this method is its simplicity, variability, and the possibility of linking it to other types of research tasks. On the other hand, the main disadvantage of applying the test is that it determines the price of each product in isolation, i.e., without interaction towards competing products.

However, for the optimal pricing decision of the company, it is also necessary to consider the cost level of the price to ensure the desired profitability of the product. In defining the optimal price, it is important to express in relation to what the optimal price is pursued, what objective is desired to be met by the pricing decision.

It is also important to stress that the price sensitivity testing method used is one of the methods within the framework of the basic product pricing approaches. Consequently, it is necessary to monitor customer reactions to a given price level and be prepared to optimize it. We did not address this part of the analysis in identifying a price that would be acceptable to consumers in terms of value perception due to the scope of the study. In conducting the research study, we focused solely on tracking the price of a product entering a saturated market segment. The prices of competing chocolates were not included in the study as the primary VW test does not allow for such an application. Since the topic of pricing is an extensive area of microeconomics, we see space for future research opportunities. Especially, in linking the ability to test price in relation to the company's intrinsic financial parameters regarding competing products that potential customers consider in the product purchase decision process and the amount of the benchmark value of the product being tested.

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Authorship

K. R. and M. K. B. designed the study and acquired the data. K. R. and J. K. provided data cleaning and analysis of the data. The draft was prepared by K. R. and M. K. B.. K. R. was responsible for revising the manuscript for important intellectual content. All authors have read and approved the final version of the manuscript.

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Key activities of digital business transformation process

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Abstract
Background: Digital transformation is by itself a fragmented area, due to different perspectives encountered in the literature. The research problem addressed in this paper is a general lack of consent on the content of digital transformation and the lack of a comprehensive framework for implementing digital transformation initiatives.
Purpose: The aim of this paper is to identify distinct key activities of digital transformation through a systematic literature review, and in doing so contribute to defining the scope of digital transformation and the structure of digital transformation as a process.
Study design/methodology/approach: This research was conducted by means of a systematic literature review, with the aim to ascertain the general structure of the digital transformation process through identification of its key activities.
Finding/conclusions: A total of 19 items were identified as activities of digital transformation, which were subsequently distributed among the 6 distinct stages of the digital transformation process, in an effort to advance the understanding of the notion and the scope of digital transformation through clarification of its content.
Limitations/future research: The results of this research should be instrumental for the future research aimed towards developing generic, universal guidelines for companies seeking to embark on digital business transformation journeys.

Keywords
digital business transformation, digital transformation process, key activities

Introduction

Rapid technological advances in this digital age are now further accelerated by the 4th industrial revolution, and we are witnessing an increased impact of digital technologies on all segments of life. The new digital ecosystem has extremely shortened product life cycles and made consumer behaviour increasingly demanding and unpredictable. Faced with this reality, companies are forced to continuously adapt and transform their businesses. The extent and contents of the transformation are dictated by a company's industry, as well as the level of involvement of digital technologies into its business processes.

Digitalization is the main cause behind more than half companies vanishing from the "Fortune 500" list after 2000 (von Leipzig et al., 2017). According to Leipzig et al. (2017), digitalization is a part of the major global trend of the fourth industrial revolution (Industry 4.0), offering great possibilities transforming existing business models, but at the same time, threatening to render entire business models obsolete.

Digitalization has completely transformed consumer behaviour and their expectations, which

implicitly compelled companies to redesign their businesses on order to win new or retain existing customers. Customers no longer expect companies to just respond to their articulated needs, but also expect them to anticipate and address their future needs even before they become aware of these needs themselves.

Even though most companies today experiment with digital transformation, recent case studies examining successful transformation show that the improvement of competitive positioning is less dependent on the technology being adopted, and more by the applied strategic approach to implementation. There is still a large gap between companies' intentions to transform their businesses digitally and the ultimate success of such initiatives (Ismail, Khater & Zaki, 2017).

To ensure that digital transformation will create additional business value, a company should first carefully formulate a digital transformation strategy, aimed at coordinating many independent threads of digital transformation and assist in solving problems arising from internal complexity and ambiguities in identifying advantages applications of digital technology (Hess, Benlian, Matt, & Wiesböck, 2016). According to Hess et al. (2016), such a digital agenda should be in alignment with other operational and functional strategies, and if so, may serve as a unifying concept for integrating all efforts on coordination, prioritization, and implementation in a digital transformation.

Despite the need for a comprehensive and systematic approach to digital transformation, one that would encompass all its elements, from prioritization of initiatives, through mechanisms of coordination, identified risks, to implementation steps, researchers have not yet presented a coherent framework for digital transformation (Hess et al., 2016; Matt, Hess, & Benlian, 2015).

1. Background

The scope of the concept of digital transformation is still unclear, due to different perspectives encountered in the literature. Ismail et al. (2017) noted that "unrefined search for academic publications using the keyword 'digital transformation' yields thousands of articles, which examine the phenomenon from various perspectives" (Era, Network, Company, Institutional, Individual, Industry/ Ecosystem, Social/ Economic), which sometimes overlap.

The research problem addressed in this paper is a general lack of consent on the content of digital transformation and the lack of a comprehensive framework for implementing digital transformation initiatives.

The aim of this paper is to identify distinct key activities of digital transformation through a systematic literature review, and in doing so contribute to defining the scope of digital transformation and the structure of digital transformation as a process.

2. Method

This research was conducted by means of a systematic literature review, in alignment with the recommendations provided by Barbara Kitchenhand (2004). The aim of the literature review was to identify, evaluate and synthesize dominant attitudes related to the research topic of this paper. The literature review comprised three distinct stages: planning, conducting the review and reporting. The aim of the planning stage is to clearly define the research protocol for the purpose of mitigating the risk of arbitrary selection of research materials for analysis. Detailing the research protocol comprises the following activities (Kitchenham, 2004):

- Articulation of the of the research aim
- Wording of the research questions the literature review should answer
- Definition of the strategy to be used for the primary search for the research material, including the search terms and sources
- Definition of selection criteria for research materials, i.e., inclusion or exclusion of particular studies from the literature review
- Definition of quality assessment criteria for research materials
- Definition of the data extraction strategy
- Definition of the data synthesis strategy

The aim of this research was to ascertain the general structure of the digital transformation process through identification of its key activities. For this to be achieved, the research should answer the following research questions:

- RQ1: What are the key activities of digital business transformation?
- RQ2: What distinct phases can the key activities of digital business transformation be grouped into?

The strategy for the primary search for research material within the protocol developed for this literature review encompassed the following databases: Web of Science, Scopus, and the AIS

eLibrary. In addition to evaluation of the primary research materials, the developed research protocol also involved a secondary search, i.e., review of research materials referenced by the works identified in the primary search. After the selection of sources for the primary search, we defined the following search terms: "digital business transformation" AND ("activity" OR "activities").

The inclusion/exclusion criteria defined for this research were as follows:

- Inclusion criteria: only works - papers in academic or professional journals and conference/workshop proceedings - published between 2011 and 2018 in English and matching the search terms in the title or the abstract were included in the literature review.
- Exclusion criteria: all works related to the key words, albeit predominantly focused on technical aspects of digital transformation and with little attention on different business aspects of digital transformation were excluded from the research. In addition to that, papers not based on empirical research and papers based on the authors' unfounded personal opinions and perspectives were also excluded.

The criteria for evaluation of research materials conforming to the previously described inclusion and exclusion criteria are listed in table 1-1, in accordance with recommendations by Dybå & Dingsøyr (2008) and Kofod-Petersen (2014). According to by Dybå & Dingsøyr (2008), quality criteria should serve to evaluate papers from three key aspects: credibility, methodological strictness, and significance. Each paper is assessed in terms of each evaluation criterion, with assessments ranging from "Yes", through "Partially", to "No", which were quantified as 1, ½, and 0, respectively (Kitchenham et al., 2009).

Table 1 Criteria for evaluating research materials

QC Nr.	Quality criterion	Possible rating
QC1.	Is the research aim clearly defined and articulated?	Yes/Partially/No
QC2.	Is the research put into adequate context?	Yes/Partially/No
QC3.	Are research methods clearly defined?	Yes/Partially/No
QC4.	Does the study reference empirical findings?	Yes/Partially/No
QC5.	Are research results clear and thoroughly analysed?	Yes/Partially/No
QC6.	Do results have practical significance?	Yes/Partially/No

Source: adapted from Dybå & Dingsøyr, 2008; Kofod-Petersen, 2014

Extraction strategy for data necessary to answer the research questions involved repeated reading of all selected works, with text coding, discovery of topics grouping them into appropriate concepts and categories. The data synthesis strategy relied on comparing and cross-referencing the identified categories, themes, and concepts.

Table 2 Results of the primary search for research materials

Source	Papers matching key words	Papers included in further analysis	Papers included in further analysis, after removal of duplicates	Number of papers excluded
Web of Science	**225**	**18**	**17**	**199**
Scopus	**209**	**14**	**9**	**192**
AIS eLibrary	**451**	**13**	**11**	**435**
Total:	**885**	**45**	**37**	**826**

Source: the authors

As per the defined research protocol, the systematic literature review was initiated with a search for research material in the specified databases, using the search terms listed above. Results of the initial search, in terms of numbers of matches per each database, are given in table 1-1. The preliminary selection of research material against the exclusion criteria was primarily based on analysis of titles and abstracts, and, where necessary, the entire text. After removing duplicate matches (8), a total of 37 papers were included in further analysis and subject to detailed examination - repeated reading and evaluation against the criteria for evaluation of research materials. The evaluation had led to the exclusion of additional 26 papers, which resulted in 11 relevant papers selected for further analysis. A secondary search was conducted in parallel with the detailed analysis and evaluation of primarily selected papers, based on references included in them. The secondary search resulted in additional 4 papers being selected for detailed analysis and evaluation, 2 of which were finally deemed relevant to this research after the application of the same evaluation criteria.

3. Results

The idea of using business process management concepts for addressing problems in digital business transformation is not new. This particular idea is central to the research by Imgrund, Fischer, Janiesch, & Winkelmann (2018), in which the authors tried to identify characteristic demands related to digital transformation and sought possibilities for applying principles of business process management to address the identified requests. The authors highlighted the interdependence between digital business transformation and business process management and pointed to the possibilities for applying principles based on business process management in digital business transformation initiatives. A summary of their findings on how business process management may assist digital business transformation is presented in Table 3. Just like in business process management, to overcome the challenges of digital business transformation, organizations must develop additional capabilities, define and execute a digital strategy, increase digital awareness, adapt their attitudes, and define security guidelines.

Table 3 Capabilities of BPM to Address the Requirements of Digitalization

Requirement	Facilitation of digital transformation through business process management
Expertise	Cross-functional knowledge spill-overs facilitate collaboration and co-creation. Process models enable knowledge management and information exchange.
Flexibility	Improved coordination and communication increase agility and flexibility.
Involvement	Process orientation connects all part of an organization
Digital strategy	Process models facilitate focusing on core competencies and foster innovation. …supports the awareness and acceptance towards change.
IT strategy	- uses IT for process automation, digitization, and data integration. - aligns technological and business structures.
Collaboration	- uses production models to facilitate collaboration. - facilitates modularization through process building blocks.
Security	entails the formulation of rules and guidelines.
Culture	creates a cross-functional culture and defines roles.

Source: Imgrund et al., 2018

Digital transformation is a necessity for most companies today. However, just the initiation of digital transformation is usually a challenging endeavour, coupled with numerous challenges. In an endeavour to identify these challenges, von Leipzig et al. (2017) analysed digital transformation along its several phases - initiation, execution, and coordination. The authors identify challenges organisations must face throughout digital transformation, such as: inadequate IT infrastructure, lack of technical skills, inadequate business processes, high risks and implementation costs, cultural barriers that is often underestimated and remains unrecognised, as well as people's resilience towards changes and their indifference towards a radical change as digital transformation.

In their analysis, von Leipzig et al. (2017) offer suggestions for initiating digital transformation. As digital transformation has the potential for major organizational changes, these changes should be initiated from a strategic level within the company and disseminated throughout the entire company. Such changes may undoubtedly enact changes to business processes, improve customer satisfaction, and reduce operational costs. However, initiation of changes without setting prior strategic directives is a common problem for companies. As a solution to this problem, the authors (Leipzig et al., 2017) proposed a model aimed at assisting companies to successfully initiate digital transformation. The model was developed along Deming's PDCA (Plan Do Check Act) cycle, it is iterative, and ultimately aimed at correct initiation of digital transformation based on a developed digital strategy, facilitation of cultural changes, and encouragement of digital mindset. Along with the presented model, Leipzig et al. (2017) provided guidelines for stimulating innovation to be used in the initiation of digital transformation: using multiple alternative perspectives, seeking for potentially new technologies, paying attention to signals from the market for early discovery of new trends, development of ideas in line with external perspectives and encouragement of experiments.

According to their model, Leipzig et al. (2017) suggest that the initiation of digital transformation should be carried out with respect to the industry in question. Based on the type of industry, a digital transformation may be initiated with an analysis of operational business processes, analysis of the business model, or analysis of customer contact points. The model suggests that a company should identify its potential for digital business transformation through repeated analyses of its clients, the marker, competitors, as well and other industries. The authors particularly emphasize the significance of analysing other industries, as customers who become accustomed to certain digital services expect similar experience regardless of the industry. In addition to that, the

model suggests using benchmarking for assessing the company's position compared to its competitors, allowing it to become aware of its strengths and weaknesses, as well as new ideas on how to improve its operations. Ideas may be generated both from internal and external sources. Although internal sources are invaluable, the authors particularly emphasize the value of external sources for innovative ideas, as they have greater potential for providing provide new perspectives on innovation and improvement. Generated ideas are latter subject to classification and assessment. The aim of assessment is to identify costs that that the implementation of the idea may incur, as well as the revenue the potential change may generate and its overall impact on business. Selection is followed by the preparation of implementation and the implementation itself, while the feedback mechanism is used for subsequent assessment of the improvement, as well as comparison of the company's progress with the progress of its competitors. Overall results serve as input for the next iteration of the model implementation. With each following iteration, the company should elevate its capabilities for innovative thinking, further incorporate digital thinking into its digital strategy, and improve its willingness for further changes to the digital strategy.

As was previously stated, digital transformation has the potential to induce the most complex changes to a company's business model. In their research, Schallmo and Williams (2017) argued that the literature present at that time did not have all the necessary answers. Their research resulted in a framework for digital transformation of business models (Fig. 1.), which factually represents a roadmap for digital transformation. This roadmap consists of 5 phases: digital reality, digital ambition, digital potential, digital fit, and digital implementation (Schallmo & Williams, 2017), each of the phases incorporates several activities, detailed in Fig. 1.

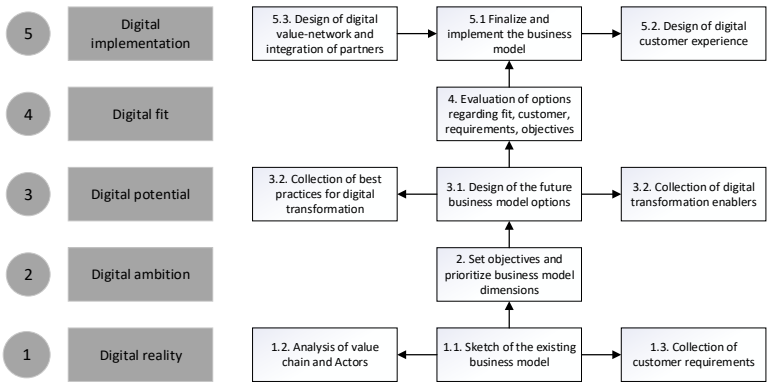

Figure 1 Roadmap for DT
Source: Schallmo (2016) as cited in Schallmo and Williams (2017).

Technological advances provided companies with capabilities for synthesizing information from raw data in an effortless manner and use the revealed information to track and discover new trends and gain competitive advantage. The abundance of information may encourage companies to change their approaches from modifying their business models to innovating them. Schallmo and Williams (2017) proposed a balanced approach, combining digitalization of processes and operations with advancement of user experience, i.e., balance between focus on internal and external factors. Such a balanced approach should result in new, successful business models and effective digital businesses.

Sathananthan, Hoetker, Gamrad, Katterbach, and Myrzik (2017) proposed a methodology for designing a digital business model based on a BMI (Business Model Innovation) framework, which should assist in understanding and assessing present business models, developing new ideas for digital transformation, and drafting novel business models based on improved understanding of market developments. The model proposes using the BMI framework in an iterative manner, from as-is analysis to the specification of a new business model. The first step proposed in the methodology involves describing the present business model. The second step involves analysing internal and external factors, preferably by means of a SWOT matrix. The third step includes development and assessment of ideas for possible improvements of

the existing business model. As this step may yield numerous ideas, they should be evaluated with the aim to select those that may best improve the existing business model through application of digital technologies. The following stage involves detailed analysis of selected ideas and projection of their impact on the business model, i.e., envisioning the structure of the new business model if the selected ideas are implemented. Evaluation is the final stage proposed in this methodology, where the new business model is assessed against the data gathered during its implementation.

Companies may initiate business transformation based solely on internal motivations, such as identified organizational problems. This approach requires drafting use cases and solution specifications. Defined use cases are subsequently assessed in terms of technical feasibility and cost-effectiveness. In such settings, profound understanding with the company's business processes and its technology is paramount to successful prioritization of digital initiatives. However, as key actors of digital transformation initiatives often lack this level of understanding, such approaches devoid of a strategic view of the organization often result in failures. Therefore, several authors recommend combining "top-down" and "bottom-up" approach, so that individual digital initiatives be integrated into the strategic vision of the organization. Pflaum and Michahelles (2018) proposed an iterative four-step process to guide companies in doing so.

The first step in the process is the development of a business strategy, i.e. establishment of a strategic vision, followed by its breakdown into individual business initiatives. Ideas for individual digital business initiatives are then translated into use cases, which are later subject to assessment, prioritization, and finally, implemented. The second step proposed in the process is knowledge creation, and the first task in this step is to develop a data model based that would facilitate collection of information necessary for solving the problems identified in use cases. In the following step, knowledge application, companies should use analytical tools and models to discover new knowledge and insights. The final step involves deciding how the developed solution should be integrated the current process landscape. Adoption of each digital initiative advances the company to its strategic vision, and often requires that the vision and plans be revised (Pflaum & Michahelles, 2018).

Current literature recognizes traditionalism as an important obstacle to digital transformation, especially among large companies. Abandonment of traditional practices is often a difficult endeavour for such companies. Sebastian, Ross, and Beath (2017) proposed a roadmap for digital transformation for large, traditional (or, in the authors' original wording, "big old") companies. They recommend that companies do the following (Sebastian et al., 2017):

1. define a digital strategy
2. invest in operational backbone
3. architect a digital services platform
4. design digital services with partners in mind
5. adopt a services culture

Having examined frameworks available in the literature and elucidated their natures, Ismail et al. (2017) concluded that each of framework involves most of the content associated with digital strategy, and that all are divided into phases that follow each other. This is the origin of the idea that digital transformation is a process, which advances along stages, and not a set of individual events. The authors (Ismail et al., 2017) identified 6 common phases (listed in Table 4.) that can be recognized in all the frameworks.

Table 4 Phases common to all digital transformation frameworks

Phase	Description
Initiation	Understanding digitalization opportunities, threats, and impact
Ideation	Imagining transformation dimensions as options for the business
Assessment	Evaluating digital readiness levels and identifying gaps
Engagement	Communicating the vision and integrating the necessary people
Implementation	Proceeding with the action plan in various domains
Sustainability	Validating and optimizing the action plan continuously

Source: Ismail et al. (2017)

The authors (Ismail et al., 2017) further noted that, despite the fact that there seems to be an abundance of available strategic frameworks, individual frameworks are usually constricted to an individual aspect of digital transformation or a particular industry. In relation to these findings, the authors finally highlight the necessity for "additional frameworks indifferent contexts to allow us to comprehend the DT phenomenon in more depth" (Ismail et al., 2017).

A total of 19 items were identified as activities of digital transformation, which were subsequently distributed among the 6 distinct stages of the digital transformation process:

1. Initiation (as-is analysis)
2. Ideation
3. Assessment
4. Transformation planning
5. Implementation
6. Ensuring Sustainability

The comprehensive list of key activities of digital transformation, grouped by stages, is provided in Table 5.

Table 5 Key activities of digital business transformation identified in the literature review

Nr.	Stage / Activity	Source(s)
S1.	Initiation (as-is analysis)	
1.	Exploration of opportunities, threats, and effects of digital transformation (SWOT analysis)	Imgrund et al., 2018; von Leipzig et al., 2017; Ismail et al., 2017; Schallmo & Williams, 2017; Sathananthan et al., 2017
2.	Analysis of competition (Benchmarking)	
3.	Analysis of client requests	
4.	Mapping and analysis of the present business model	
S2.	Ideation	
1.	Research on the best practices of digital transformation	von Leipzig et al., 2017; Schallmo & Williams, 2017; Ismail et al., 2017; Sathananthan et al., 2017
2.	Generation and assessment of ideas (initiatives) that alter different aspects of the present business model through the introduction of digital technologies	
3.	Design of options of the future (transformed) business model	
S3.	Assessment	
1.	Assessment of digital readiness and identification of gaps	Imgrund et al., 2018; von Leipzig et al., 2017; Schallmo & Williams, 2017; Sebastian et al., 2017; Pflaum & Michahelles, 2018
2.	Analysis and estimation of potential costs and benefits of implementation	
3.	Prioritization and final selection of the idea (initiative) to be implemented	
S5.	Implementation	
1.	Execution of the action plan	von Leipzig et al., 2017; Ismail et al., 2017; Schallmo & Williams, 2017
2.	Continuous validation and optimization of the action plan	
3.	Finalization and implementation of the new/modified business model	
S6	Sustainability	
1.	Evaluation and analysis of data extracted from the new business model for continuous innovation	von Leipzig et al., 2017; Ismail et al., 2017; Sathananthan et al., 2017

Source: the authors

Conclusion

The diverse nature of digital technologies, rapid pace of their development and diffusion, and numerous transformational effects on businesses have led to different notions and interpretations of digital business transformation in the present literature on this matter. It can also be concluded that most of currently available works only deal with individual aspects of digital business transformation or are narrowly focused on a particular industry or type of organization, and that the present literature lacks universal and comprehensive approaches to all important aspects of systematic planning and implementation of digital transformation. As the complexity of digital business transformation exceeds that of ordinary, technology-induced transformation, study of its theoretical and practical aspects necessitates a thorough and holistic approach.

The aim of this research was to advance the understanding of the notion and the scope of digital transformation through clarification of its content, i.e., key activities of digital transformation initiatives. Extraction and synthesis of different authors' perspectives on this topic from the presently available literature resulted in an overview of key activities of digital transformation and distinct stages of the digital transformation as an organizational process.

The results of this research should be instrumental for the future research aimed towards developing generic, universal guidelines for companies seeking to embark on digital business transformation journeys.

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The impact of financial performance on the profitability of advertising agencies in the Slovak Republic

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Abstract
Background: To improve operational and financial policies regarding the allocation of existing and obtaining new resources, strategic decision-making, managers use indicators of financial performance.
Purpose: The aim of this study is to analyze the impact of financial performance on the profitability of advertising agencies in Slovakia.
Study design/methodology/approach: A sample of 88 Slovak advertising agencies was analyzed by means of regression modeling the data based on financial statements of the financial year 2020. The hypothesis that the indicators of financial performance of advertising agencies in Slovakia have an impact on their profitability is partly confirmed by the results of this research. The first proposed model was adjusted by excluding the independent variable Current Ratio, which allowed us to build the second model to explain 95.21% of the Return on Assets deviation due to the variation of the selected independent variables.
Findings/conclusions: By selecting Return on Assets as a dependent variable that characterizes the financial performance of advertising agencies, research has shown that Total Assets Turnover and Firm Size have significant positive influence on it, but Debt to Equity Ratio has a negative influence. This empirically testifies the expediency of financing the activities of advertising agencies from debt resources, scaling the scope of their activities and increasing sales using innovative approaches for getting more customers.
Limitations/future research: The study limitations relate to completeness of information and availability of open access to the necessary data in the published financial statements of Slovak advertising agencies. The results of this research could be applicable and beneficial for providers of capital for advertising agencies. It could be also used as a tool to determine key factors of profitability and to adjust companies' financial and operational policies.

Keywords
profitability, financial performance, advertising agencies, regression analysis, return on assets

Introduction

Modern research in the field of accounting and finance shows that elements of the financial statements and financial ratios have different effects on the company's value and indicate the quality of financial performance. Scholars continue to discuss which factors have a decisive influence on financial performance, and how they affect the financial performance of enterprises in a particular industry. The focus of this study is concentrated on the activity of advertising agencies in Slovak Republic. The main strategic aim of advertising agencies is to increase their profitability, thus financial performance for them is crucial as it indicates the effectiveness of their policy. This implies the need to find effective solutions for management of advertising agencies, to improve their profitability, based on identifying the characteristics of key factors that determine its achievement.

In recent years, the Slovak Republic has been experiencing a steady increase in advertising costs - in 2012 this figure was 258 million EUR, compared to - 368 million EUR in 2019 (Guttmann, 2021). However, according to Mediaguru media agency, net advertising costs in 2020 remained at 352.1 million EUR and decreased by almost 21 million EUR compared to 2019 (Krasko, 2021). According to representatives of Interactive Advertising Bureau Slovakia it a growth in the Slovak advertising market was forecast for 2021, in particular the rise in advertising costs in the country by 28% (Interactive Advertising Bureau Slovakia, 2021), primarily media and video advertising. But even such a rapid growth did not enable Slovakia to reach the level of market development in 2019. The current situation evidences the gradual recovery and development of advertising agencies activities in Slovakia. Basically, this is due to the spread of such trends in this area as Green Marketing, Influencer Marketing, Digital Marketing and SMM. This necessitates for scientists to pay attention to issues of profitability management of advertising agencies. In particular, to determine the characteristics of the impact of profitability factors will help managers of these enterprises to adjust current managerial policies and financial decisions, and also to make strategical changes that will improve their margins, increase the profits, and ensure sustainable development. It will allow advertising agencies to identify areas for creative and innovative solutions in their activities, areas for improving business processes, help to eliminate inefficient operations, reduce bloated processes, streamline workflows, and optimize marketing services they provide.

This research focuses on financial performance issues with relation to the profitability indicators of advertising agencies. Many studies are dedicated to the influence of financial performance on the profitability, but only a few studies have been conducted in the Slovak Republic which did not relate to the analysis of advertising industry.

The main hypothesis of this study is that the financial performance indicators of advertising agencies in Slovakia (Company Size, Current Ratio, Debt to Equity Ratio, Total Assets Turnover) have an impact on their profitability (Return on Assets). The paper contributes to the existing research by presenting empirical evidence on the relationship between financial performance indicators of advertising agencies and its profitability, based on the study of Slovak companies.

The paper is organized in the following way. The introductory part reveals the relevance of the study. The second section brings literature review. The process of data collection and methodology is introduced in the third section. The results are presented in the following section. Finally, the last section provides conclusions of the research and recommendations for improving advertising agency's profitability.

1. Literature review

Since profitability is one of the key indicators of the company, the investigation of the impact of various types of internal and external factors on it was conducted in many papers by scientists who analyze the features of its impact in different economic sectors.

The article identifies several groups of scientists who have conducted research in this area. Representatives of the first group study the impact of available resources or groups of resources (elements of enterprise assets, certain activities of the enterprise), which affect profitability of a company. Due to the gradual formation of the knowledge-based economy, in recent years, studies of the impact of intangible factors of enterprise value creation have become especially relevant. Some scholars dedicate their papers to issues of the impact of intellectual capital on the entities' profitability (Sik & Kim, 2020; Kaymaz, Yilmaz & Kaymaz, 2019; Suherman, 2017; Seo & Kim, 2020; Petković & Dordević, 2021; Lehenchuk, Tumpach, Vyhivska, Makarovych & Laichuk,

2022; Serpeninova, Lehenchuk, Mateášová, Ostapchuk & Polishchuk, 2022). Other researchers analyze the effect of certain activities on the profitability of enterprises. For instance, Riaz, Furqan and Siddique (2015) studied the impact of advertisement expenses on the banks' profitability. Ullah (2019) examined the influence of advertising on profitability of listed companies in Pakistan.

Representatives of the second group study the level of significance of the impact or features of the relationship (positive, negative, neutral) between the capital structure of the enterprise (ratio of own and borrowed resources) and its profitability. The aim of the research is to determine optimal capital structure to ensure maximum profitability. Today, this is one of key questions that financial managers face, and which scientists can answer. The subject of such research is mainly those types of enterprises that attract additional share capital, and which provide recommendations for improvement the adaptability of capital components. The influence of the capital structure on the profitability was investigated in the papers of Abor (2005), Salawu and Awolowo (2009), Addae, Nyarko-Baas and Hughes (2013), Singh and Bagga (2019), Chandra et al. (2019), Fekadu (2020), Derbali (2021), Chandra, Junaedi, Wijaya and Ng (2022), Georgakopoulos, Toudas, Poutos, Kounadeas and Tsavalias (2022), Irawan, Pulungan, Subiyanto and Awaludin (2022), Pham, Hoang and Pham (2022), Habibniya, Dsouza, Rabbani, Nawaz and Demiraj, (2022).

Representatives of the third group of scholars study the direct effect of financial performance on the entities' profitability in various sectors of the economy (banking industry organizations, coal mining companies, food and beverage companies, bidder companies, service firms, textile industry companies etc.) in different countries. The main scientific controversies among scientists in such studies concentrated on which indicators will be used for analysis of profitability of the enterprise. Namely, which variables will be dependent or independent, and which indicators will be used to characterize the financial performance of the enterprise. Depending on the chosen set of variables, the analysis of the impact of the latter on the former is carried out. Correlation between financial performance indicators and profitability of enterprises is the focus of research by Pandian and Narendran (2015), Al Shahrani and Zhengge (2016), Linawati and Halim (2017), Fauziyah and Djamaluddin (2021), Gopu, Imran and Hanaa (2021), and Herdiyana, Sumarno and Endri (2021).

As a result of the literature review, no studies devoted to the analysis of financial performance impact on the advertising or marketing agencies profitability in Slovak Republic were found. Thus, this research brings sound contribution to the formation of recommendations for improving advertising agencies' profitability.

2. Methodology

To determine the impact of the indicators of financial performance of advertising agencies on their profitability, a sample of 88 Slovak advertising companies was selected (Appendix 1). The necessary data for calculating financial performance indicators of advertising companies was taken from annual financial reporting of such companies for the 2020 year. All 88 observed Slovak advertising agencies are limited liability companies, most of which (83%) are private domestic entities.

Multilinear regression was used to analyse such variables as ROA (Return on Assets); CR (Current Ratio), DEqR (Debt to Equity Ratio), TAT (Total Assets Turnover), and 1 CS (Company Size). The higher the company's ROA means the higher the level of achieved profitability. Choosing ROA as a dependent variable in comparison with other indicators which characterise profitability of the enterprise is proved by its broad application by scholars Linawati and Halim (2017), Singh and Bagga (2019), Ullah (2019), Kaymaz et al. (2019), Herdiyana et al. (2021), Fauziyah and Djamaluddin (2021). On the other hand, ROA is used by the management of advertising agencies to adjust current managerial policies and making decisions, because ROA reflects the effectiveness of management in the context of using the company's assets at their disposal. In addition, in comparison with other indicators of profitability (ROE, ROIC, ROCE), ROA shows how efficiently the company operates both its own and borrowed resources. This justifies its application while making financial decisions by the company's management and external capital providers (investors, borrowers).

The suggested model is checked for adequacy (by means of F critical value) and the lack of multicollinearity (by means of correlation matrix).

To examine the relationships between the ROA (dependent variable) and indicators that characterize financial performance of advertising agencies (independent variables), such indicators must be calculated based on financial statements (Table 1).

Table 1 Variables' characteristics

Variable		Meaning	Calculation	Data type from financial statements
Dependent Variable				
ROA	Return on Assets	Indicates relation between profitability and total assets	$ROA = \frac{Net\ Profit}{Total\ Assets}$	Net turnover (V1), Total assets (S1)
Independent Variables				
CR	Current Ratio	Indicates ability to pay current obligations	$CR = \frac{Current\ Assets}{Current\ liabilities}$	Current assets item (S33), Current liabilities item (S122)
DEqR	Debt to Equity ratio	Indicates the proportions of company's equity and liabilities of a company is using to finance its assets	$DEqR = \frac{Total\ Liabilities}{Total\ Equity}$	Current liabilities item (S122), Long-term liabilities item (S101), Total assets item (S1)
TAT	Total Assets Turnover	Indicates the efficiency of company's ability to use its assets to generate income	$TAT = \frac{Total\ Sales}{Total\ Assets}$	Revenues from sales of goods (V3), Revenues from sales of own products (V4), Revenues from sales of services (V5), Total assets item (S1)
l_CS	Company Size	Indicates a size of a company	$l\_CS = Ln(Total\ Assets)$	Total assets item (S1)

Source: the authors

2. Analysis and results

2.1. Model 1

This research hypothesizes that the suggested indicators of financial performance of advertising agencies have an impact on their profitability indicator – ROA.

This study tests the connection between such indicators and the advertising firms' ROA using regression model (Table 2).

Table 2 Initial data for regression model 1

REGRESSION MODEL	
Dependent variable	**Independent variables**
ROA – Return on Assets	**CR** – Current Ratio
	DEqR – Debt to Equity Ratio
	TAT – Total Assets Turnover
	l_CS – Company Size

Source: the authors

Tables 3.1-3.2 show the results by means of OLS method. It presents the level to which the independent variable influences the dependent variable.

Table 3.1 Model 1. OLS, using the observations 1-88

	Coefficient	Standard error	T-statistics	P-value	Significance by t-statistics
const	−1.07432	0.394659	−2.722	0.0079	***
CR	0.00323216	0.00285369	1.133	0.2606	
DEqR	−0.00445232	0.00249838	−1.782	0.0784	*
TAT	0.958469	0.0239596	40.00	<0.0001	***
l_CS	0.0740984	0.0312633	2.370	0.0201	**

Source: calculated via Gretl software package

Table 3.2 Model 1. OLS, using the observations 1-88

Indicator	Value	Indicator	Value
Mean dependent var.	1.805105	S.D. dependent var.	2.479148
Sum squared resid.	25.19858	S.E. of regression	0.550997
R-squared	0.952875	Adjusted R-squared	0.950604
F(4, 83)	419.5679	P-value (F)	3.53e-54
Log-likelihood	−69.84243	Akaike criterion	149.6849
Schwarz criterion	162.0715	Hannan-Quinn	154.6751

Source: calculated via Gretl software package

The following equation demonstrates Model 1:

$$\hat{y} = -1.07432 + 0.00323216x_1 - 0.00445232x_2 + 0.958469x_3 + 0.0740984x_4 \quad (1.1)$$

where: $\hat{y}$ – ROA;
x_1 – CR;
x_2 – DEqR;
x_3 – TAT;
x_4 – l_CS.

The absence of asterisks symbols in the corresponding column of the table 3.1 indicates the insignificance of the independent variable CR. This is confirmed by the level of significance of the parameter (P-value), which allows to test hypotheses about the significance of each indicator and select significant ones and insignificant model variables. For example, CR has P-value 0.26, that is, 26% to make a mistake is a clear exaggeration of the chosen level of significance. Table 3 shows that the most important parameters are constant (P-value =0.0079) and TAT (P-value =<0.0001).

The content of the indicators of the regression equation of Model 1 (1.1) is as follows:
1. If CR increases by 1, then ROA increases by 0.00323216;
2. If DEqR increases by 1, then ROA decreases by 0.00445232;
3. If TAT increases by 1, then ROA increases by 0.958469;
4. If Company Size (l_CS) increases by 1, then ROA increases by 0.0740984.

Model 1 shows that among the suggested parameters (excluding the constant), all parameters have a direct impact on the resulting, except DEqR. Thus, increasing this independent variable DEqR will reduce the dependent variable (ROA).

Table 3.2 indicates that the coefficient of determination of the suggested model equals 0.9529, which means that approximately 95.29% of ROA variation can be described by selected independent variables and more specifically by applying the corresponding equation (1.1).

The closer the value of the coefficient of determination to 1, the better the model is recognized. But the problem of estimating multiple linear regressions (those with more than one independent variable) may consider such independent variables that have nothing to do with the dependent variable. Therefore, the adjusted coefficient of determination (Adjusted R^2) must be used, which allows comparing models with different numbers of factors so that their number does not affect the statistics. As it might be seen from Table 3, the difference between the unadjusted and the adjusted coefficient of determination is not significant (95.29% -95.06% = 0.23%). The adjusted coefficient of determination, which is usually less than the unadjusted value, is considered to be a more accurate characteristic of the predictive power of the regression model.

The next step is to test the model for multicollinearity. To allow further use of the proposed model, it is necessary to reject the assumption that there are close linear relationships between the selected independent variables. That is, the existence of multicollinearity between factors must be rejected. Multicollinearity is present when such a relationship becomes 0.7 or more. If there are close links between the parameters, they must be removed from the model. Fig. 1 presents a correlation matrix of Model 1, which proves that the multicollinearity between the selected independent variables is absent.

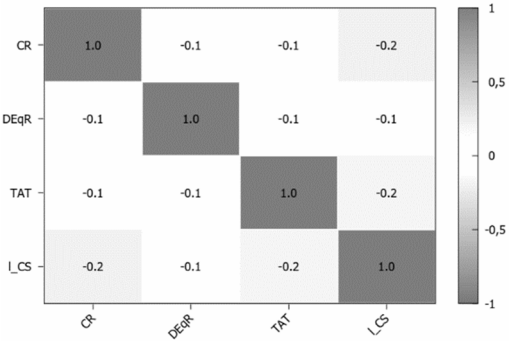

Figure 1 Correlation matrix of Model 1
Source: calculated via Gretl software package

A necessary step in testing Model 1 is to test it with an F-test (Fisher's test) with a probability of 0.95. The actual (Ffact) and critical (Fcrit) values of F must be compared. Table 3 indicates the observed value - F (4, 83) = 419.5679. Table 4 shows the F critical value.

Table 4 The F critical value for Model 1

F(4, 83)	
Right-tail probability	0,05
Complementary probability	0,95
Critical value	**2,48166**

Source: calculated via Gretl software package

The main condition of F-test is satisfied, because Ffact (419.5679) > Fcrit (2.48166). According to the results of this test, Model 1 is

considered adequate for sample data at the level of reliability (confidence interval) of 95% or with a probability of error of 5%. Since Ffact is higher than Fcrit, the null hypothesis about the random nature of factors is rejected and their statistical significance in the context of the influence on the dependent variable (ROA) is recognized.

Model 1 is consistent in the context of high values of both unadjusted and adjusted coefficient of determination (95%), and has a lack of multicollinearity between selected independent variables, adequacy of sample data according to the tested Fisher's test. To improve Model 1 it is necessary to review the selected independent variables in the context of their statistical significance, as the parameters include those that are considered insignificant. Thus, such parameter as CR (table. 3) has P-value 26%, which is an exaggeration of a given level of significance, and therefore a high level of acquisition of erroneous value. It means this independent variable does not influence significantly on the selected dependent variable, thus should be excluded from the model. Therefore, there is a need to adjust Model 1 and construct Model 2.

2.2. Model 2

The initial data for Model 2 are the same as for Model 1, except for one independent variable, the results of which identified statistical insignificance relative to the result. Results are presented in the tables 5.1-5.2.

Table 5.1 Model 2. OLS, using the observations 1-88

	Coefficient	Standard error	T-statistics	P-value	Significance by t-statistics
const	−0.940602	0.377220	−2.494	0.0146	**
DEqR	−0.00474829	0.00248886	−1.908	0.0598	*
TAT	0.955136	0.0238182	40.10	<0.0001	***
l_CS	0.0655303	0.0303853	2.157	0.0339	**

Source: calculated via Gretl software package

Table 5.2 Model 2. OLS, using the observations 1-88

Indicator	Value	Indicator	Value
Mean dependent var.	1.805105	S.D. dependent var.	2.479148
Sum squared resid.	25.58805	S.E. of regression	0.551924
R-squared	0.952147	Adjusted R-squared	0.950438
F(3, 84)	557.1204	P-value (F)	2.59e-55
Log-likelihood	−70.51728	Akaike criterion	149.0346
Schwarz criterion	158.9439	Hannan-Quinn	153.0268

Source: calculated via Gretl software package

The following equation demonstrates Model 2:

$$\hat{y} = -0.940602 - 0.00474829x_1 + 0.955136x_2 + 0.0655303x_3 \quad (1.2)$$

where $\hat{y}$ – ROA;
x_1 – DEqR;
x_2 – TAT;
x_3 – l_CS.

Model 2 is characterised by the statistically significant independent variables (Table. 5). TAT is the most significant parameter (P-value =<0.0001), which indicates that it has the strongest influence on ROA (dependent variable).

The content of indicators of the regression equation of Model 2 (1.2) is as follows:

1. If DEqR increases by 1, then ROA decreases by 0.00474829;
2. If TAT increases by 1, then ROA increases by 0.955136;
3. If Company Size (l_CS) increases by 1, then ROA increases by 0.0655303.

Equation of Model 2 shows that among the proposed parameters (excluding the constant), all parameters have a direct influence on the resulting, except DEqR.

Table 5 indicates that the coefficient of determination of Model 2 is 0.9521. The difference between the unadjusted and the adjusted coefficient of determination is insignificant

(95.21%-95.04%=0.17%). The adjusted coefficient of determination, which is usually less than the unadjusted value, is considered to be a more accurate characteristic of the regression model.

Figure 2 shows that multicollinearity between the selected independent variables is absent.

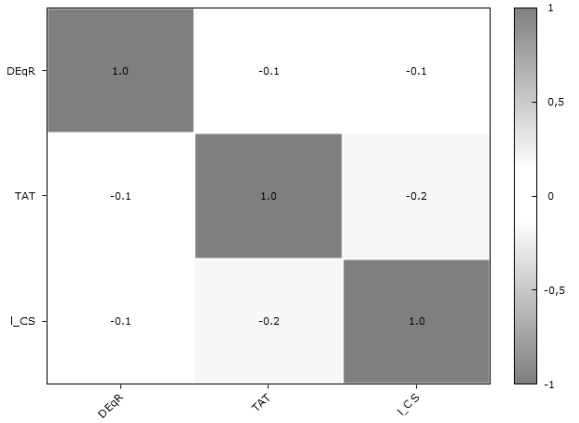

Figure 2 Correlation matrix of Model 2
Source: calculated via Gretl software package

Testing of Model 2 via Fisher's test with a probability of 0.95 is presented in table 6.

Table 6 The F critical value for Model 2

F(4, 83)	
Right-tail probability	0,05
Complementary probability	0,95
Critical value	**2,71323**

Source: calculated via Gretl software package

The basic requirement of F-test is satisfied, because Ffact (557.1204) > Fcrit (2.71323). According to the results of this test, Model 2 is considered as adequate (95%) or with a 5% probability of error. Since Ffact is higher than Fcrit, the null hypothesis about the random nature of factors is rejected and their statistical significance in the context of the influence on the dependent variable (ROA) is recognized.

Model 2 is consistent in the context of high values of both unadjusted and adjusted coefficients (95%), characterized by a lack of multicollinearity between selected independent variables, adequacy of sample data according to Fisher's test and statistical significance of all selected independent variables.

Conclusion

To ensure further progressive development and active implementation of marketing innovations, advertising companies need to increase the efficiency of their management based on empirical analysis of selected factors. The aim of this article is to determine whether financial performance has a significant influence on the advertising agencies profitability *inter alia.*

The initial data for regression analysis are: the sample consisted of 88 Slovak advertising agencies; the dependent variable is the ROA indicator for 2020 year; independent variables are CR, DEqR, TAT, l_CS for 2020 year. As a result, two models were tested. Model 1 includes all allocated independent variables, and Model 2 was built based on the previous one with the corresponding optimization of independent variables. The main hypothesis that the financial performance indicators of advertising agencies in Slovak Republic have an impact on their profitability was partially justified by testing Model 1. To test the hypothesis, Model 2 was used by excluding the independent variable from Model 1 CR, according to the results of testing which identified its statistical insignificance relative to the resulting indicator. It can be concluded from the study of the effect of financial performance indicators on the profits of the Slovak advertising agencies using Model 2 that 95.21% of the variation of ROA can be explained by the variation of such independent variables: const, DEqR, TAT, l_CS.

The paper makes a significant personal contribution to the existing body of scientific literature by presenting empirical evidence on the relationship between financial performance indicators and the profitability. Based on the analysis of advertising agencies' activities in Slovakia, it was established that their profitability (ROA) depends on DEqR, TAT and l_CS. Thus, DEqR has a negative influence on ROA, which confirms the expediency of financing the activities of advertising agencies from debt resources (loans, bonds etc.), to improve their profitability. Another indirect proof of this thesis is the absence of a significant effect of CR on ROA. To increase the profitability of advertising agencies, first of all, the efficiency of using their assets should be reinforced, in particular, assets of intangible nature, which a play crucial role in creating the long-term value of enterprises in the conditions of society digitalization and formation of the knowledge-based economy. An increase in the size of advertising agencies will have a positive effect on their profitability, which indicates the need to find ways to scale the activities of such companies in Slovakia, in particular, through transactions with mergers and acquisitions.

The results of this research could be applicable and beneficial for providers of capital for advertising agencies. It could be also used as a tool to determine key factors of profitability and to adjust companies' operational and financial policies. As a result of the research, some empirically based recommendations for improving advertising agencies' profitability could be suggested. Thus, TAT has the most important impact on the ROA of advertising agencies. It means that for such enterprises the solution for increasing profitability is to increase sales using innovative approaches for getting more customers and to reduce costs (controlling overhead costs, reducing resource waste, streamlining manual processes, streamlining workflows, ditching inefficiencies using IT solutions).

This study has some limitations, which are related to completeness of information and availability of open access to the necessary data in the published financial statements of Slovak advertising agencies. The study was conducted for the limited period of the financial reporting year 2020.

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Appendix 1

Sample for regression model: reporting data of 88 Slovak advertising companies

№	Company	№	Company	№	Company	№	Company
1	Surgitech	23	CREATIV LINE	45	Google Slovakia	67	reklama4U
2	Sales House SK	24	J&Z Partners	46	STARMEDIA Co.	68	VIZIO
3	PRO PRODUCTION media solutions	25	Freelancers	47	LEOPARD PRODUCTION	69	MARBEX
4	GULDAN - STUDIO	26	Producentské centrum TOMAX film	48	MUW DIGITAL	70	SOUND PROMOTION
5	via LS	27	BEKI Design	49	STURM	71	agentúra crea
6	Pro Media Consulting	28	RR Company SK	50	MPay Slovakia	72	4from media
7	GF and F	29	TEPEDE EDC	51	Euro - Agency	73	PEKNÁ MODRÁ
8	B.O.A.T. Publicity	30	REEST	52	UNIMEDIA	74	CLUBOX
9	ELEMENT AGENCY	31	OKAMIH	53	Service Creativ	75	TRIUMF DUCHA
10	Top Advert SK	32	A SMS	54	HENRIETTA - direct marketing	76	Better Group
11	PROXIMA-3 D spoločnosť s ručením obmedzeným	33	BRAND ADVERTISING	55	ZA advisory	77	REKLAMA Q POPRAD
12	A grafik	34	Twoagency	56	2create	78	FineMedia
13	PC News	35	voicecasting	57	idealist	79	G&G svetelné reklamy
14	M-PRESS	36	CONNY	58	Fusion Home	80	famous design
15	REDES	37	AREX - DK	59	ZenithMedia	81	Swixx Biopharma
16	ROCK PRINT	38	WEST MEDIA	60	Connect Media	82	MONDO - reklamná agentúra
17	iPARTNER	39	Berger.bros	61	EXIT model management	83	ASRS
18	UNIQSHOP	40	TRITY PLUS	62	Kliment & Fazekas	84	METS Slovakia
19	BALÍK PLUS	41	B.S. Solutions	63	starlite media	85	REBLOK
20	AKAT studio	42	goodgames	64	MultiMedia	86	H1 Slovakia
21	SolventMedia	43	Komfort AC	65	POLYGON-PREMIUM	87	COMUNIQUE
22	Grafdekor	44	EMHA – real	66	X design	88	UPTOWN PRODUCTION

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The effect of the inflation rate on gross domestic product: an economic analysis for the Western Balkans countries

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Abstract
Background: One of the key indicators of a country's macroeconomic stability is certainly inflation. During the past year, there has been a general increase in inflation in Europe. The question arises as to how inflation affects other relevant indicators of the stability of a country. One of the most important indicators is gross domestic product.
Purpose: This paper analyses the effect of the inflation rate on gross domestic product in the countries of the Western Balkans for the period 2006-2021, which includes the initial period of the emerging health crisis.
Study design/methodology/approach: Official data from the World Bank was used to review the analysis of the state of inflation and gross domestic product. The same data was transformed into appropriate logarithms for proper econometric modelling. The methodology used to determine the effect of the inflation rate on the gross domestic product is multiple regression analysis with the ordinary least squares estimation method.
Findings/conclusions: The results of the analysis indicate a positive effect of the gross domestic product deflator on economic growth in the sample countries, while the impact of inflation measured according to the consumer price index is not significant.
Limitations/future research: Recommendations for decision-makers about inflation targeting, and further methodological approaches are given as part of the research conclusions.

Keywords
GDP deflator, consumer prices, consumer basket, countries in transition, Balkans, monetary policy, ANOVA, logarithmic values

Introduction

The main goal of macroeconomic policy is to maintain the level of economic growth while maintaining a low inflation rate, particularly in transition (Pollin & Zhu, 2006, p. 5) and developing countries (Sabir, Rafique & Abbas, 2019). According to the classical economic theory, whose main representative is Adam Smith, it is necessary to conserve a balance between supply and demand, as well as it is necessary to encourage the population to save and invest so that the country's economy can tend to grow.

The monetarist framework or Keynesian theory, which is led by the AD-AS model, contributes to a more comprehensive linking of the inflation rate with the rate of economic growth. In this regard, the aggregate supply – aggregate demand theory dictates that monetary growth plays a key role in determining inflation and that inflation growth and economic growth move together (Kremer, Bick & Nautz, 2013; Pollin & Zhu, 2006). In other words, according to this theory, inflation affects economic growth. Conversely, a very high inflation rate contributes to a decline in economic growth, both in highly developed and in small open inflation-targeting economies (Nasir, Huynh & Vo, 2020).

On the other hand, newer economic theories, such as the neoclassical theory (whose main exponents are Solow and Swan), explain the impact of inflation on economic growth by taking

into account the parameters of capital accumulation and investment (Najeb, 2014). Investments as well as capital accumulation are key elements of economic growth. Solow was the first economist to include technological progress as a determinant of economic growth.

According to classical theory, inflation is the result of the process of monetary emission due to public deficits, which increases demand and leads to an increase in prices. Therefore, to suppress inflation effectively, the emission of currency must be stopped, which can only be achieved by withdrawing demand, either in the private sector, by increasing taxes, in the public sector, or by reducing national (public) spending. In other words, suppression of inflation is achieved through recessionary policy (Li, Tang & Xiang, 2020).

Differently, and according to Keynesian and neoclassical theory, inflation is not the result of excess demand caused by monetary emissions. Instead, monetary emission is the result of inflation, not its cause. Therefore, inflation could be suppressed without a recessionary policy, but by freezing wages and prices.

Inflation is defined as a monetary phenomenon that is a consequence of excessive monetary expansion, i.e. an increase in the general price level. The country's economic growth is represented as GDP, which is the sum of goods and services produced in one year. The value of production of foreign companies in the domestic country is included in this total, while the value of production of domestic companies in foreign countries is excluded. In other words, GDP represents the total domestic income of a country.

In the countries of the Western Balkans, the level of GDP has fluctuated in the last twenty years, since the transition process began in these economies. In the period 2000-2010, the GDP of these countries grew on average, while inflation was moderate and under control. In this period, the economy of Serbia had the highest growth in both GDP and inflation (Tošković, 2015, pp. 94-104).

The Western Balkans is a group of countries consisting of Serbia, Slovenia, North Macedonia, Croatia, Montenegro, Bosnia and Herzegovina, and Albania. Of this group of countries, two are members of the European Union (Slovenia and Croatia). According to the classification of countries by income, only Slovenia and Croatia belong to the high-income countries group. The other four economies are classified as middle-income countries in transition (IWA, 2021). A large number of research and economic studies have been carried out for the group of countries of the Western Balkans (e.g. Despotović, Cvetanović & Nedić, 2014; Gabrisch, 2015; Pere, 2015; Tošković, 2015; Fetai, Koku, Chaushi & Fetai, 2016; Zdraveski, Janeska & Taleska, 2016; Đurović-Todorović, Đorđević & Tomić, 2016; Jusufi & Bellaqa, 2019; Vladi & Hysa, 2019; Rehman, Çela, Morina, & Sulçaj-Gura, 2019; Mansi, Hysa, Panait, & Voica, 2020; Nedić, Despotović, Cvetanović, Djukić & Petrović, 2020; Perić & Stanišić, 2020; Karadžić & Pejović, 2021), which, in addition to political and geographical characteristics, makes it economically relevant as well. Therefore, the selection of this group of countries for the present analysis is additionally relevant.

In the next part of this paper, the theoretical framework related to the relationship between inflation and economic growth, along with the research hypotheses, is presented. In the third part of this paper, explanation of the methodology used to measure the effect of the inflation rate on GDP growth is presented. The fourth part of this research presents the results and discussion of the results. In the fifth and the last part of this research, conclusions were drawn and recommendations were formulated for future research and decision-makers.

1. Measures of inflation: GDP deflator versus CPI

GDP is the sum of the gross value added of all resident producers in the economy and all taxes on products minus all subsidies that are not included in the value of products. According to the methodology of the World Bank, it is calculated without subtracting the depreciation value of factory assets and without the degrading natural resources.

The implicit GDP deflator is the ratio of GDP in current local currency to GDP in constant local currency:

$$GDP\ deflator\ (p) = \frac{GDP\ in\ current\ prices}{GDP\ in\ base\ year\ prices} * 100 \quad (1)$$

Similarly, a GDP deflator is a ratio of nominal and real GDP:

$$GDP\ deflator = \frac{nominal\ GDP}{real\ GDP} \quad (2)$$

The consumer price index and consumer price inflation rate are generally calculated using the

Laspeyres formula:

$$L = \frac{\sum_{j=1}^{J} q_{kj} p_{ij}}{\sum_{j=1}^{J} q_{kj} p_{kj}} \quad (3)$$

According to the Laspeyres formula, *J* is the base region, *i* is every other region, *j* are all items in the consumer basket, *k* is quantity and *p* are prices (Pearson, 2019). According to Đurović-Todorović et al. (2016, p. 58), the general formula of the consumer price index is:

$$CPI = \frac{current\ price\ level}{price\ level\ according\ to\ base\ period} * 100 \quad (4)$$

The logic of this formula is compatible with the GDP deflator equation, while the general inflation rate formula is:

$$\%\ inflation = \frac{p(t)-p(t-1)}{p(t-1)} * 100 \quad (5)$$

where *t* represents the time period, *p* the price level, and *t - 1* the previous time period.

Although the difference between deflator GDP and CPI may appear to be non-existent or very small, in essence, there is a significant difference.

Taking into account the difference between these two indicators can point out significant dissimilarities in income and consumption (Dinterman & Katchova, 2020). Based on those dissimilarities, strategic steps to reduce consumption and increase income can be taken when it comes to the national economy. The key difference is that the GDP deflator reflects the prices of all goods and services produced in a given country, and uses the prices of currently produced goods and services, while the CPI reflects the prices of a consumer basket of goods and services whose buyers are producers, and uses fixed prices (due to taking into account fixed goods and services). Similarly, Turner, Lauer, Tran, Teerawattananon and Jit, (2019) point out the importance of the methodologies used for adjusting costs (for inflation) that are obtained from different periods.

2. The relationship between inflation and economic growth

The importance of the relationship between inflation and economic growth is comparable to the relationship between health/disease and the human body. Good health has a positive impact on the human body, so healthy (balanced) inflation is a warranty for a country's economic growth. Otherwise, unhealthy (unbalanced) inflation can ruin a country's economy, like a virus. Reasonably, in many countries and for decades there has been constant research on the impact of inflation on GDP (e.g. Rehman, Ali & Shahzad, 2020; Chen, Dolado & Gonzalo, 2021).

Recent studies have demonstrated the importance of measuring the impact of inflation-targeting on macroeconomic indicators. For example, Das & Ghate (2022) claim that inflation contributes in financing government debt, but only under the flexible inflation-targeting policy, while Ullah, Apergis, Usman and Chishti (2020) claim that inflation instability and GDP growth volatility can have both positive and negative impacts on the economy in terms of pollution emissions.

This paper provides an overview of the literature on the relationship between inflation and economic growth, as shown in Table 1.

Table 1 Inflation rate and GDP level: empirical research

Research	Aim and methodology	Results
Armesh, Salarzehi, Yaghoobim & Heydari (2010)	Impact of inflation on GDP in Iran for the period 1961-2005 using OLS regression	GDP has a negative and statistically significant impact on the inflation rate
Arsić, Mladenović & Nojković (2022)	Impact of inflation targeting in European and Asian emerging economies for the period 1997-2019 using regression	Inflation targeting reduces GDP volatility, inflation rate, and inflation volatility, although not affecting inflation persistence or economic growth
Barro (2013)	Impact of inflation on GDP in over 100 countries for the period 1960-1990 using OLS regression	Increasing inflation has a negative and statistically significant impact on GDP
Chien, Chau, Sadiq & Hsu (2022)	Impact of economic and non-economic determinants on the natural resources commodity prices volatility in China for the period 1986-2019 using regression	Inflation and GDP growth have positive impact on natural resources commodity prices
Fetai et al. (2016)	Analysis of the impact of macroeconomic indicators on GDP in the countries of the Western Balkans for the period 1994-2015 using OLS regression	Inflation has a negative and statistically significant impact on GDP
Kasidi & Mwakane-mela (2013)	Impact of inflation on GDP in Tanzania for the period 1990-2011 using OLS regression	Inflation has a negative impact on GDP growth, which is statistically significant in the short term,

		while there is no evidence of statistical significance in the longer term
Koulakiotis, Lyroudi & Papasyrio-poulous (2012)	The relationship between inflation and GDP in 14 developed European countries for the period 1961-2008 using OLS regression	The relationship between inflation and GDP is positive. Inflation affects GDP and vice versa
Kryeziu & Durguti (2019)	Impact of inflation on GDP in 17 Euro-zone countries for the period 1997-2017 using OLS regression	Inflation has a positive and statistically significant impact on GDP
Mandeya & Ho (2021)	Impact of inflation and inflation uncertainty on economic growth in South Africa for the period Q1 1961 – Q4 2019 using regression	Inflation has a negative impact on economic growth in both the short- and long-run
Obradović, Šapić, Furtula & Lojanica (2017)	The relationship between inflation and GDP in Serbia for the period Q1 2007 - Q3 2014 using OLS regression	Inflation has a positive effect on GDP in a short period, while other variations of the influence have not been determined
Umaru & Zubairu (2012)	Impact of inflation on GDP growth in Nigeria for the period 1970-2010 using OLS regression	GDP and GDP per capita affect inflation while inflation does not affect GDP except through productivity enhancement
Xiao (2009)	The relationship between inflation and GDP in China for the period 1978-2007 using OLS regression	Inflation and GDP are in a positive relationship for a long period of time, while the impact of GDP on inflation depends on the amount of investments in a short period

Source: the author

Armesh et al. (2010) found that there is a negative and statistically significant relationship between inflation and GDP. On the other hand, Kasidi and Mwakanemela (2013) found that inflation growth has a negative effect on GDP growth. As far as the analysis for Serbia is concerned, it was established that there is a direct causality of inflation concerning GDP, but that there is no direct causality of GDP in relation to inflation (Obradović et al., 2017).

Xiao (2009) found that the relationship between inflation and GDP is positive when the level of investment is controlled. In this sense, the relationship between inflation and GDP will not be negative as long as investments do not grow rapidly, especially in a short period (Xiao, 2009; Barro, 2013). Similarly, inflation has a positive impact on GDP growth (Kryeziu & Durguti, 2019) when the level of production and productivity are boosted in an economy (Umaru & Zubairu, 2012).

Barro (2013) analyzed the impact of inflation in 117 countries for the period 1960-1970, 122 countries for the period 1970-1980, and 119 countries for the period 1980-1990. This sample of countries also includes the countries of former Yugoslavia. Using data from the World Bank and applying regression models, the results of Barro's research showed that an increase in the average level of inflation by 10% per year affects the decrease in the growth rate of real GDP per capita by an average of 0.25% per year. In addition, this level of increase in inflation has the effect of reducing the ratio of GDP to investments by an average of 0.5% per year. Similar results were found in the analysis of Fetai et al. (2016), where these authors found a negative relationship between inflation and GDP. Namely, all four regression models (Pooled OLS, Fixed Effects, Random Effects, and Hausman Taylor) indicated a negative (statistically significant) impact of the inflation rate on economic growth in the countries of the Western Balkans.

Additionally, inflation can respond to GDP growth shocks, as GDP can respond to inflation shocks. As for Apostolakis and Papadopoulos (2019), using the regression estimation on the data for the period 1999–2016 in 19 advanced economies, an inflation shock has a negative impact on GDP growth.

Moreover, Ehigiamusoe, Guptan and Narayanan (2021) found that the level of inflation rate (measured in CPI) impacts the relationship between financial development and GDP. Their analysis encompassed a sample of 125 countries, both developed and developing. These authors argue that the outcome of their analysis applies mostly to middle-income countries.

As a whole, these studies indicated a binary relationship between inflation and GDP, that is, that inflation can affect GDP both positively and negatively (Musarat, Alaloul, & Liew, 2021) as well as that GDP can affect inflation, positively or negatively. Koulakiotis et al. (2012) argue that inflation affects GDP just as GDP affects inflation. In this regard, it can be argued that the level and nature of the impact depend on several macroeconomic indicators, the time period taken into account for the analysis (state of stability or crisis period), as well as the level of development of the country.

Based on the review of the literature, it can be argued that the level of the inflation rate can have both a positive and a negative impact on the GDP

of countries, which depends on the movement of other macroeconomic indicators. In any case, there is no consensus in the professional and scientific literature about the impact of inflation on economic growth (Pollin & Zhu, 2006, p. 2). Certainly, a three-digit number, and often a two-digit number of the inflation rate (hyperinflation) does not contribute to economic growth.

In addition to the above, the lack of empirical research on the impact of inflation on GDP in the countries of the Western Balkans from the point of view of the regression approach, especially since the beginning of the pandemic caused by the new coronavirus, was determined as well. An additional incentive for conducting this research is the emerging threat of an increase in the rate of inflation, which can drastically affect the slowdown of the economic growth of these countries, especially countries in transition.

Although relevant research has been published, the research about the inflation impact on GDP (while differentiating GDP deflator and inflation based on CPI) for the Western Balkan countries during the COVID-19 crises and the war in Ukraine, and after the inflation overtook many European countries, has not been published, to the knowledge of the author of this paper. Therefore, this paper is about to cover the mentioned gap in the literature.

The null hypothesis is that GDP deflator has negative and statistically significant impact on GDP in the Western Balkan countries, while the alternative hypothesis is that this impact is significantly positive.

In the following part of this paper, the data and methodology used to measure the impact of the inflation rate on GDP in the countries of the Western Balkans are presented.

3. Research methodology

In this research, an appropriate econometric model based on theoretical foundations is used to determine the level of influence of inflation on GDP in the countries of the Western Balkans.

This part of the paper is divided in two sections. In section 3.1, the data and sample used for modelling is described. The assessment method and the model used in this research is presented in the section 3.2.

3.1. Data and sample

The analysis uses annual data collected from the World Bank database (World Bank, 2022). The variables used for the analysis are consumer price index (CPI), inflation, deflator, and % change in GDP level. The definition of the variables is presented in Table 2.

Table 2 Definition of data and indicators for analysis

Name / Label	Description	Source
GDP growth / GDP%	Annual percentage growth rate of GDP at market prices based on constant local currency. Aggregates are based on constant 2015 prices, expressed in US dollars.	Calculation according to data on national accounts of the World Bank and OECD.
Inflation, GDP deflator / INFL_ DEFL%	Inflation measured using the annual growth rate of the implicit GDP deflator shows the rate of change of prices in the overall economy.	Calculation according to data on national accounts of the World Bank and OECD.
Inflation, consu-mer prices / INFL_ CPI%	Inflation measured using the consumer price index represents the percentage change in the costs of the average consumer for the purchase of a basket of goods and services that can be fixed or can change over a certain period of time, here annually.	Calculation according to the International Monetary Fund, according to the data of the International Financial Statistics.
Consu-mer price index / CPI	Consumer price index indicates changes in the costs of the average consumer for the purchase of a basket of goods and services that can be fixed or can change in a certain period of time, here yearly.	Calculation according to the International Monetary Fund, according to the data of the International Financial Statistics.

Source: the author

The unit of measure for GDP growth, GDP deflator, and inflation is in percentage (%) on the annual basis, while CPI is an index, period average, yearly (2010=100).

3.2. Assessment method and the model Section

Regression analysis, which includes statistical operations and mathematical models, is one of the most appropriate econometric analyzes that shows the relationship between variables numerically, based on which their relationship is described in real environments. For the regression analysis to make sense, all variables must at least theoretically be related to each other (Perić & Filipović, 2021, p. 250). The main goal of conducting regression analysis is to estimate the values of unknown variables based on those values that are known. In this research, ordinary least squares (OLS) estimates of all regression parameters, namely coefficients, standard errors, t-values, and

probability values, are estimated. In addition, summary statistics (R-squared, adjusted R-squared, regression standard error, and residual sum of squares) is designed with the aim of diagnosing possible deviations from the original hypotheses.

The specification of the model relies on general rules from the field of econometrics. It relies on the examples of similar models that were taken into account with the specification and description of the model in this research according to Rangarajan (2012), Barro (2013) and Perić and Filipović (2021), as well. The general specification of the model is:

$$ln\, Y_{it} = \beta_0 + \beta_1 + \sum_i ln\beta_{it} + \varepsilon_{it} \quad (6)$$

where:

lnY_{it} represents the logarithmic value of the dependent variable in the country *i* and in year *t*, *i.e.* the estimated value of the dependent variable,
β_0 represents the intercept of the model and the estimated value of the dependent variable when the coefficients are equal to zero,
the sum $ln\beta_{it}$ represents the logarithmic value of the independent variables for country *i* in year *t, i.e.* the logarithmic value of the regression coefficients,
ε_{it} represents the standard error of the model prediction.

The specific specification of the model is:

$$lnGDP\%_{it} = \beta_0 + lnINFL\_DEFL\%_{it} + lnINFL\_CPI\%_{it} + lnCPI_{it} + \varepsilon_{it} \quad (7)$$

where:

$lnGDP\%_{it}$ represents the logarithmic value of GDP in the country *i* and in year *t* and the value of the dependent variable,
$lnINFL\_DEFL\%_{it}$ represents the logarithmic value of the GDP deflator in the country *i* and in year *t, i.e.* independent variable of the model,
$lnINFL_CPI\%_{it}$_it represents the logarithmic value of inflation calculated according to the consumer price index in the country *i* and in year *t, i.e.* independent variable of the model,
$lnCPI_{it}$ represents the logarithmic value of the consumer price index in the country *i* and in year *t, i.e.* independent variable of the model.

The data were transformed into the natural logarithm due to the normalization of the data distribution: N = (0, σ^2). In the event of a 1% change in one independent variable, a change in the dependent variable is expected in the value of the coefficient of that independent variable, while the other independent variables of the model remain constant. H_0 is that the regression coefficients $lnGDP\%_{it}$, $lnINFL\_DEFL\%_{it}$, and $lnINFL\_CPI\%_{it}$ negatively affect $lnGDP\%_{it}$. H_1 is that the regression coefficients have a positive effect on GDP growth. In the next part of the paper, the results of the models applied are presented.

4. Results and discussion

In this paper, the presentation of the statistical description of the data precedes the regression analysis (Table 3).

Table 3 Descriptive statistics

	N / Range	Min	Max	Mean	Std. Dev.	Vari-ance
Year	112 / 15	2006	2021	2013.5 (0.438)	4.63	21.44
INFL_ DEFL %	112 / 17.07	-1.03	16.04	2.908 (0.262)	2.776	7.71
INFL_ CPI%	112 / 14	-1.58	12.41	2.419 (0.249)	2.638	6.96
CPI	112 / 79.38	72.86	152.24	106.97 (1.25)	13.28	174,9
GDP%	112 / 27.74	-15.3	12.43	2.375 (0.375)	3.966	15.73
lnINFL _DEFL %	89 / 2.77	0	2.78	1.05 (0.07)	0.661	0.44
lnINFL _CPI%	83 / 2.49	0.03	2.52	1.009 (0.065)	0.588	0.35
lnCPI	112 / 0.74	4.29	5.03	4.665 (0.011)	0.121	0.02
lnGDP %	83 / 2.52	0	2.52	1.299 (0.056)	0.513	0.26

Source: the author

Descriptive statistics is a summary of the data set used in this paper and serves to better understand the data and analysis itself. Hereinafter, the term "inflation" is used for consumer price index (CPI) inflation, while the term "GDP deflator" remains the same.

According to Pollin and Zhu (2006, p. 2), an adequate level of inflation is between 3 and 5%, while Frattini and Crosta (2006, p. 55) believe that inflation should be around 2%, with which Kremer et al. (2013) agree but when it comes to developed countries (p. 8). The state of inflation and GDP in the countries of the Western Balkans in the period

2006-2021, which is interpreted according to the official data of the World Bank (World Bank, 2022), is summarized below.

The highest drop in GDP was documented in Montenegro (-15.31%) in 2020 compared to the previous year. In that period, the GDP deflator was -0.18% and inflation was -0.26%. In this country, negative economic growth was recorded in 2009 and 2012 (-5.8% and -2.72% respectively), compared to the previous year (7.22% in 2008 and 3.23% in 2011) when inflation had a positive sign and a low single-digit value. The highest level of inflation in this country was in 2007 (GDP deflator = 16.4%) and 2008 (inflation = 8.76%). These data are consistent with the theory of economic decline and inflation growth during the period of the financial crisis.

When it comes to the COVID-19 period in the countries of the Western Balkans, overall economy was affected, such as GDP, inflation, the ways of doing business (e.g. Szeiner, Kovács, Zsigmond & Poór, 2021), foreign direct investments (Milovanović & Marković, 2022) etc., while the new business models were developed (Erceg & Zoranović, 2022). The highest GDP growth (12.43%) was recorded in Montenegro in 2021, as well as the growth of GDP deflator and inflation (4.37% and 2.41% respectively). In terms of GDP growth, Croatia is behind Montenegro with a GDP growth of 10.45% (GDP deflator = 3.25%, inflation = 2.55%) in the same year.

In the most developed country from the sample, Slovenia, the state of GDP and inflation is slightly different than in the countries discussed above. The highest decline in GDP growth was documented in 2009 (-7.55%), which was followed by a decline in both inflation indicators. On the other hand, GDP growth in this country was also negative in 2020 (-4.23%) with inflation rates of 1.23% (GDP deflator) and -0.05%, while a sharp increase in GDP (8.11%) followed by an increase in the GDP deflator and inflation (2.55% and 1.92% respectively) was verified in 2021.

Analogous to Slovenia, inflation in Bosnia and Herzegovina was negative (-1.05%), and the GDP deflator was positive (0.18%) in 2020, followed by negative GDP growth (-3.12%), while during the next year all indicators recorded growth, namely GDP growth (7.10%), GDP deflator (1.74%) and inflation (1.98%). Excluding 2020, the lowest GDP growth rate in this country was recorded in 2009 (-3%) with inflation rates of 0.19% (GDP deflator) and -0.38%. On the other hand, the highest GDP growth rate in this country was 5.86% (BDP deflator = 6.20%, inflation = 1.50%) in 2007, followed by a decline in the inflation rate (BDP deflator_{2006} = 7.80 %, inflation according to CPI_{2006} = 6.13%).

As for inflation in the period 2020-2021, no negative inflation was recorded in Serbia, North Macedonia, and Albania. Namely, in Serbia, a negative GDP growth of -0.94% (GDP deflator = 2.45%, inflation = 1.58%) was noted in 2020, and a positive GDP growth of 7.39% and inflation (4.09% and GDP deflator = 6.09%) in 2021. In Albania, on the other hand, GDP growth was negative (-3.48%) and inflation was positive (GDP deflator = 0.68%, 1.62%) in 2020, while 2021 saw GDP growth of 8.54% as well as a GDP deflator (5.92%) and inflation (2.04%). Similarly, North Macedonia recorded negative GDP growth (-6.11%) in 2020 (GDP deflator = 0.86%, inflation = 1.20%), and positive growth of the GDP indicator, GDP deflator, and inflation one year later, *i.e.* 3.96%, 6.06%, and 3.23% respectively.

Based on this review of indicators, inflation growth and GDP growth have generally gone *pari passu*, but not always. Therefore, their causality cannot be claimed. Causality of this kind is the subject of the analysis below.

The results of the regression analysis are presented in the following equation:

$$lnGDP_{it} = 3.331 + 0.428\% - 0.216\% - 0.472 \quad (8)$$

	(const.)	(INLF_DEFL%)	(INFL (CPI%)	(CPI)
std.error	(2.149)	(0.141)	(0.146)	(0.448)
t	(1,550)	(3,029)	(-1,478)	(-1,054)
p (<0.05)	(0.127)	(0.004)	(0.145)	(0.297)
VIF	(2.263)	(2.210)	(1.261)	

R-squared = 0.213

Given the statistically significant model ($p < 0.05$), the null hypothesis is rejected because it is proven that there is a positive impact of the GDP deflator on economic growth.

When observing the results of the econometric analysis according to the above model, it was determined that the variable *lnINFL_DEFL%* is statistically significant with a positive sign and with a confidence level of 21.3%. Therefore, the GDP deflator has a positive effect on the rate of economic growth. If the GDP deflator increases by 1%, it will cause variability or GDP growth of 0.428%. ($p = 0.004$, $t = 3.029$, VIF = 2.263) while other coefficients will remain constant. This change value represents the mean positive change value for the countries *i* and the period *t*. The influence of other independent variables is

negative but not statistically significant. These results are consistent with the theoretical assumptions and empirical research of Koulakiotis et al. (2012), Kryeziu and Durguti (2019), and Obradović et al. (2017), who also found that there is a positive impact of inflation on GDP growth. On the other hand, the outcome of this analysis contradicts the research of Barro (2013). Barro measured the impact of inflation on GDP for the period 1960-1990, and it can be assumed that the time period of the research, which does not include either the global financial crisis or the emerging health crisis, affects the outcome of his analysis and the difference with the outcome of this research. In addition, this author used a sample of over a hundred countries, and it is assumed that the difference in the sample size contributes to the difference in the outcome of the regression analysis, to be precise, that the increase in inflation has a negative and statistically significant impact on GDP.

Conclusion

This research aimed to measure the impact of inflation on GDP in the countries of the Western Balkans for the period 2006-2021. The results showed that the GDP deflator has a positive effect on GDP and this outcome is statistically significant. Therefore, the main contribution of this paper is that the question of how much inflation affects GDP in the sample countries has been largely answered empirically. In addition, the results of this research have implications for the monetary policy of these countries if it is taken into account that both the level of GDP and the level of inflation varied significantly, especially during the period of the emergence of the global health crisis caused by the COVID-19 virus. In this sense, the main recommendations refer to the central banks of the Western Balkan countries to set the target inflation framework under other relevant macroeconomic indicators (e.g. employment) and monitor them on a continuous level.

The implementation of the monetary policy of the central banks of the countries of the Western Balkans, especially those in transition, should have as one of its main goals the determination of inflationary expectations for the sake of controlling inflation for a long-term period (inflation targeting). Also, these banks must manage public spending and investments in a controlled manner. To achieve this goal, central banks must provide a higher level of transparency, because in this way they will gain a higher level of credibility within the framework of monetary policy. In this way, inflation can be kept under control without limiting economic progress and GDP growth.

Recommendations for further research from the methodological aspect are as follows. Based on the same series of data used for analysis in this paper, the impact of inflation on GDP can be analyzed including random effects. Given that only fixed effects were used in this research, random effects could also be incorporated employing a linear mixed model, and with the same estimation method (OLS). In addition, to analyze the impact of inflation on GDP in each country of the Western Balkans individually, seven separate models can be constructed. Every single model would indicate the level of impact of inflation on GDP in each of the countries. Finally, from the econometric aspect of the analysis, a comparative analysis can be conducted between the model with untransformed data into natural logarithms and the model used for analysis in this paper.

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Strakić, F. (2005, October 15). Remembering users with cookies. *IT Review*, *130*, 20-21.

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Belgrade: Ministry of community and social services.

➲ **Edited book**

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➲ **Paper or manuscript**

Boškov, T., Strakić, F., Ljubojević, K., Dimitrijević, M., & Perić, O. (2007. May). *First steps in visual basic for applications*.
Unpublished paper, Faculty of Economics Subotica, Subotica.

➲ **Doctoral dissertation**

Strakić, F. (2000). *Managing network services: Managing DNS servers*. Unpublished doctoral dissertation, Faculty of
Economics Subotica, Subotica.

➲ **Master's thesis**

Dimitrijević, M. (2003). *Structural modeling: Class and object diagrams*. Unpublished master's thesis, Faculty of Economics
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D. ELECTRONIC MEDIA

The same guidelines apply for online articles as for printed articles. All the information that the online host makes available must be listed, including an issue number in parentheses:

Author, A. A., & Author, B. B. (Publication date). Title of article. *Title of Online Periodical, volume number* (issue number if
available). Retrieved from http://www.anyaddress.com/full/url/

➲ **Article in an internet-only journal**

Tanasijević, V. (2003, March). Putting the user at the center of software testing activity. *Strategic Management*, *8* (4).
Retrieved October 7, 2004, from http://www.ef.uns.ac.rs/sm2003

➲ **Document from an organization**

Faculty of Economics. (2008, March 5). *A new approach to CRM*. Retrieved July 25, 2008, from http://www.ef.uns.ac.rs/papers/acrm.html

➲ **Article from an online periodical with DOI assigned**

Jovanov, N., & Boškov, T. A PHP project test-driven end to end. *Management Information Systems*, 2 (2), 45-54.
https://doi.org/10.5937/StraMan213302003S

➲ **Article from an online periodical without DOI assigned**

Online journal articles without a DOI require a URL.

Author, A. A., & Author, B. B. (Publication date). Title of article. *Title of Journal, volume number*. Retrieved from http://www.anyaddress.com/full/url/

Jovanov, N., & Boškov, T. A PHP project test-driven end to end. *Management Information Systems*, 2 (2), 45-54. Retrieved from http://www.ef.uns.ac.rs/mis/TestDriven.html.

REFERENCE QUOTATIONS IN THE TEXT

➲ **Quotations**

If a work is directly quoted from, then the author, year of publication and the page reference (preceded by "p.") must be included. The quotation is introduced with an introductory phrase including the author's last name followed by publication date in parentheses.

According to Mirković (2001, p. 201), "The use of data warehouses may be limited, especially if they contain confidential data".

Mirković (2001, p. 201), found that "the use of data warehouses may be limited". What unexpected impact does this have on the range of availability?

If the author is not named in the introductory phrase, the author's last name, publication year, and the page number in
parentheses must be placed at the end of the quotation, e.g.

He stated, "The use of data warehouses may be limited," but he did not fully explain the possible impact (Mirković, 2001, p. 201).

➲ **Summary or paraphrase**

According to Mirković (1991, p. 201), limitations on the use of databases can be external and software-based, or temporary and even discretion-based.

Limitations on the use of databases can be external and software-based, or temporary and even discretion-based
(Mirković, 1991, p. 201).

➲ **One author**

Boškov (2005) compared the access range…

In an early study of access range (Boškov, 2005), it was found...

➲ When there are **two authors**, both names are always cited:

Another study (Mirković & Boškov, 2006) concluded that…

➲ If there are **three to five authors**, all authors must be cited the first time. For subsequent references, the first author's
name will be cited, followed by "et al.".

(Jovanov, Boškov, Perić, Boškov, & Strakić, 2004).

In subsequent citations, only the first author's name is used, followed by "et al." in the introductory phrase or in parentheses: According to Jovanov et al. (2004), further occurences of the phenomenon tend to receive a much wider media coverage.

Further occurences of the phenomenon tend to receive a much wider media coverage (Jovanov et al., 2004). In "et al.", "et" is not followed by a full stop.

➲ **Six or more authors**

The first author's last name followed by "et al." is used in the introductory phrase or in parentheses:

Yossarian et al. (2004) argued that…

… not relevant (Yossarian et al., 2001).

➲ **Unknown author**

If the work does not have an author, the source is cited by its title in the introductory phrase, or the first 1-2 words are placed in the parentheses. Book and report titles must be italicized or underlined, while titles of articles and chapters are placed in quotation marks:

A similar survey was conducted on a number of organizations employing database managers (Limiting database
access, 2005).

If work (such as a newspaper editorial) has no author, the first few words of the title are cited, followed by the year: (The Objectives of Access Delegation, 2007)

Note: In the rare cases when the word "Anonymous" is used for the author, it is treated as the author's name (Anonymous,
2008). The name Anonymous must then be used as the author in the reference list.

➲ **Organization as an Author**

If the author is an organization or a government agency, the organization must be mentioned in the introductory phrase or in the parenthetical citation the first time the source is cited:

> According to the Statistical Office of the Republic of Serbia (1978), …

Also, the full name of corporate authors must be listed in the first reference, with an abbreviation in brackets. The abbreviated name will then be used for subsequent references:

> The overview is limited to towns with 10,000 inhabitants and up (Statistical Office of the Republic of Serbia [SORS],
> 1978).
>
> The list does not include schools that were listed as closed down in the previous statistical overview (SORS, 1978).

➲ When citing **more than one reference from the same author**: (Bezjak, 1999, 2002)
➲ When several **used works by the same author were published in the same year**, they must be cited adding a, b, c, and so on, to the publication date:

> (Griffith, 2002a, 2002b, 2004)

➲ **Two or more works in the same parentheses**

When two or more works are cited parenthetically, they must be cited in the same order as they appear in the reference list, separated by a semicolon.

> (Bezjak, 1999; Griffith, 2004)

➲ **Two or more works by the same author in the same year**

If two or more sources used in the submission were published by the same author in the same year, the entries in the reference list must be ordered using lower-case letters (a, b, c…) with the year. Lower-case letters will also be used with the year in the in-text citation as well:

> Survey results published in Theissen (2004a) show that…

➲ To **credit an author for discovering a work**, when you have not read the original:

> Bergson's research (as cited in Mirković & Boškov, 2006)…

Here, Mirković & Boškov (2006) will appear in the reference list, while Bergson will not.

➲ When **citing more than one author**, the authors must be listed alphabetically:

> (Britten, 2001; Sturlasson, 2002; Wasserwandt, 1997)

➲ When there is **no publication date**: (Hessenberg, n.d.)

➲ **Page numbers must always be given for quotations**:

(Mirković & Boškov, 2006, p.12)

Mirković & Boškov (2006, p. 12) propose the approach by which "the initial viewpoint…

➲ **Referring to a specific part of a work**:

(Theissen, 2004a, chap. 3) (Keaton, 1997, pp. 85-94)

➲ **Personal communications, including interviews, letters, memos, e-mails, and telephone conversations**, are cited as below. (These are *not* included in the reference list.)

(K. Ljubojević, personal communication, May 5, 2008).

FOOTNOTES AND ENDNOTES

A few footnotes may be necessary when elaborating on an issue raised in the text, adding something that is in indirect connection, or providing supplementary technical information. Footnotes and endnotes are numbered with superscript Arabic numerals at the end of the sentence, like this.[1] Endnotes begin on a separate page, after the end of the text. However, *Strategic Management* Programming Board **does not recommend the use of footnotes or endnotes.**

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