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UNCERTAINTY, CONTROLLERS' OUTPUT QUALITY, AND ENTERPRISE PERFORMANCE: IS THERE A RELATIONSHIP?

Antonija Petrlić
University of Rijeka, Faculty of Economics and Business
antonija.petrlic@efri.hr

Neda Vitezić
University of Rijeka, Faculty of Economics and Business
neda.vitezic@efri.hr

Abstract

This paper examines the relationship between uncertainty, controllers' outputs, and enterprise performance. The aim was to prove that there is a positive relationship between competitive intensity and technological turbulence as concepts of environmental uncertainty and the controllers' output quality; i.e., that controllers' output quality has an impact on the enterprise performance. A survey was conducted among controllers of large Croatian companies, resulting in a final sample of 87 responses. Partial least squares structural equation modeling (PLS-SEM) was used to test the hypotheses. The results indicate that both competitive intensity and technological turbulence have a positive and significant effect on the controllers' output quality, and ultimately that controllers' output quality has a positive and significant effect on enterprise performance.

Keywords: *Controllers' output quality, Uncertainty, Competition, Technological turbulence, Enterprise performance*

1 INTRODUCTION

Controllers are internal economists, experts, consultants, and business analysts who help companies increase the efficiency and effectiveness of their operations and achieve set goals and values by analyzing various business areas (Vitezić & Lebefromm, 2019). Accordingly, their main role is to provide management with accurate, timely, significant, and comprehensive information through various outputs, i.e., analyses, reports, suggestions, etc. Due to digitalization, the speed of change, environmental uncertainty, and the related expansion of available data, controllers have become business partners of managers (Schäffer, 2019), and their associated analytical and informational role puts them in the position of co-bearers of responsibility in the decision-making process (Vitezić, Lebefromm, & Petrlić, 2019). They become co-responsible for efficient and effective business performance. Whereas the efficiency of the controller is reflected in the transformation of various data and information into quality outputs, the effectiveness results from the final impact of these outputs on managerial decision-making (Weißenberger & Angelkort, 2011) and company performance (Ismail, Isa, & Mia, 2018).

The impact of the outputs on decision-making and performance depends on the quality of the outputs. Thus, the quality of the controllers' outputs is influenced by different factors inside and outside the company. Internally, the quality of the controllers' outputs is influenced by the organizational structure; strategic orientation of the company; internal relations; organizational culture; level of technological adoption, including the quality of information systems; and other organizational characteristics (Ghasemi, Azmi Mohamad, Karami, Hafiz Bajuri, & Asgharizade, 2015; Hammad, Jusoh, & Ghozali, 2013; Pangaribuan, 2016; Weißenberger & Angelkort, 2011; Zoni, 2017); as well as by the knowledge, skills, and abilities of controllers as output creators and of managers as their users (Sathe, 1982). However, although the internal factors can be controlled to a large extent, the external factors are mostly beyond control, although they are equally influential or even more influential, and therefore important. From numerous studies, it can be concluded that the influence of the characteristics of the environment is limited mainly to the analysis of the characteristics of globalization and related technological changes. That is, different combinations of external environment factors occur, related to market dynamism, hostile environment, uncertainty of changes, competitiveness, perceived environmental uncertainty, rate of environmental change, complexity, level of technological changes or turbulence, etc. (e.g., Ahmad & Zabri, 2015; Eker & Eker, 2019; Jaworski & Kohli, 1993; Kafetzopoulos, Psomas, & Skalkos, 2019; Krishnan & Ramasamy, 2011; Miller & Friesen, 1983; Ojra, 2014).

In the field of controlling, most researchers consider the influence of competition (Ghasemi et al., 2015; Ghasemi, Azmi Mohamad, Karami, Hafiz Bajuri, & Asgharizade, 2016; Ismail et al., 2018; Löfsten & Lindelöf, 2005; Mia & Clarke, 1999) on controller and firm performance. However, technological turbulence, which is a phenomenon that measures the extent to which the application of new technologies determines the possibility of business growth, the creation of new ideas, the improvement of business processes, and the more efficient use of available data and information, undoubtedly is an important element in analyzing the controller's overall effectiveness, that has not been investigated in terms of its relationship with controllers' output quality.

Therefore, this paper examined the relationship between environmental uncertainty in terms of technological turbulence and competitive intensity, and the controllers' output quality, and its relationship to enterprise performance. A survey was conducted among controllers from large Croatian companies. Partial least squares structural equation modeling (PLS-SEM) was used for model testing.

This study contributes to the field of controlling, specifically to the controller profession by confirming the importance of controllers' involvement in decision-making. The study underscores the importance of external factors, with emphasis on technological turbulence, which includes IT innovations, and which controllers must take into account when making their output, i.e., analyses and recommendations for decision-making purposes.

The paper is structured as follows. After the introduction, the second section presents a literature review of the relationship between environmental uncertainty and controllers' output quality, and enterprise performance, and the set conceptual model with hypotheses. The third section provides the methodology of the study, including the process of data collection, sample description, and the measurement of research variables. Section 4 presents the results of the conducted empirical study, followed by the discussion and conclusion, along with limitations and suggestions for further research.

2 LITERATURE REVIEW

Numerous factors can affect the efficiency and effectiveness of controllers' work, and, consequently, enterprise performance. According to Sathe (1982), the controllers' level of involvement in business decision-making depends on three basic categories: (1) characteristics of the controllers, (2) characteristics of managers, and (3) company and environmental characteristics. Therefore, controller involvement is defined as the degree to which controllers perform different roles as participants in operational and strategic business decision-making, that is, the role of presenting information and analysis, proposing action plans, and being ready for the challenges that these plans bring (Sathe, 1982). Thus, their role is to ensure quality outputs—analyses, plans, reports, and recommendations. The set framework was applied in the research of Zoni and Merchant (2007), and Rouwelaar, Bots, and de Loo (2018). Whereas Rouwelaar et al. (2018) examined the influence of organizational and controller characteristics, Zoni and Merchant (2007) focused mainly on company and environmental characteristics. To confirm the influence of external factors on the controller involvement in decision-making, Zoni and Merchant (2007) used environmental change measured through seven categories, including technical developments and competitor actions. Although other research has investigated the impact and relationship of different internal and external characteristics on controllers' involvement and their impact on performance (Fadhilah, Harahap, & Setyaningrum, 2015; Pierce & O'Dea, 2003; Wolf, Weißenberger, Wehner, & Kabst, 2015), Rouwelaar et al. (2018) justifiably points out their scarcity.

As already mentioned, in the field of controlling, competition is the most researched environmental uncertainty factor. For example, Ghasemi et al. (2015) confirmed the direct and positive relationship between the level of market competition and the change in management accounting system (MAS) information and its impact on organizational performance, as well as the direct relationship between MAS information and organizational performance. Similar relationships were proven by Ghasemi et al. (2016) and Mia and Clarke (1999) regarding the impact of competition on performance. Ismail et al. (2018) proved that the use of MAS information has an impact on performance, but no significant impact of the intensity of market competition on the use of MAS information was proven. Lindelöf and Löfsten (2006) proved that aggressive competition affects controlling (i.e., management accounting defined by planning, controlling, costing, directing, and decision-making systems) in terms of overall importance and the importance of budgeting and investment planning.

According to Mia and Patiar (2001), when competition increases, it is important for managers to use market information for decision-making. Thus, in a competitive environment that creates turbulence, stress, and uncertainty, active organizations will scan the environment for data and information to create a benefit (Ghasemi et al., 2015). Due to the current vast amount of information, managers are not expected to perform the process of data mining and analysis. Therefore, as competition and uncertainty increase, controllers' information increasingly is needed by management to compete effectively and make proper decisions using accurate and up-to-date information (Ahmad & Zabri, 2015). By using external and internal information as inputs to their analysis, controllers as business partners in decision-making increase the quality of their outputs and consequently improve the performance of the organization. Thus, the competition will influence the controller's role of ensuring quality information for proper decisions.

Considering the main role of controllers and the concepts of digitalization and big data, the turbulence of technological change plays an important role in the quality and overall effectiveness of controlling. For example, Herwiyanti (2015) used technological uncertainty as a mediator to demonstrate the impact of information technology capability on the quality of the controllers' outputs. In addition, authors outside the area of controlling (e.g., Pratono, 2018) use information technology (IT) turbulence as a measure of environmental unpredictability, which can be applied directly to controlling in terms of the use of IT and efficient reporting and forecasting. However, most research addressing the impact of technological turbulence on the controller's role does not study its impact as a separate phenomenon, but instead considers it as an item of environmental uncertainty; it is studied through perceived environmental uncertainty (PEU). For example, Eker and Eker (2019) investigated how environmental uncertainty, as a construct of technological, market, and competitive uncertainty, affects management control systems and performance. Rachmawati and Saudi (2019) proposed a model in which they emphasized that environmental uncertainty affects the quality of management accounting information systems (MAIS) and that the quality of MAIS affects the quality of management accounting, i.e., controllers' information. Jorissen, Laveren, Martens, and Reheul (n.d.) investigated the relationship between PEU, MAS, and company performance. Lal and Hassel (1998) examined the effect of PEU, rated by the manager, on MAS in terms of scope, time, aggregation, and integration. They concluded that when environmental uncertainty, including technological change, is high, managers will consider additional MAS information to be useful to cope with complexity. Similarly, Agbejule (2005) proved that the higher the level of PEU, the more positive is the relationship between the use of MAS and managerial performance. Technological breakthroughs and innovations enable the development of many new products (Jaworski & Kohli, 1993) but also create better business processes and enable more-efficient use of data in analysis and business decision-making. It is likely that companies operating in an environment of frequent technological change, and those making technological breakthroughs, are more dependent on the use of quality decision-making input, but also will be the driving force for the application of new technologies to improve these inputs. In short, the quality of controllers' outputs as a prerequisite for good decision-making is constantly under the influence of technological change. Therefore, we propose the following hypotheses:

H1: *There is a positive and significant relationship between environmental uncertainty and controllers' output quality.*

H1a: *There is a positive and significant relationship between competitive intensity and controllers' output quality.*

H1b: *There is a positive and significant relationship between technological turbulence and controllers' output quality.*

Weißenberger and Angelkort (2011) analyzed the influence of the integration level of accounting systems and the consistency of financial language on controller output quality and its impact on management decisions. The quality of the controlling department's output was measured in terms of scope, timeliness, or accuracy, as perceived by management. A similar study was conducted by Fadhilah et al. (2015). Wixom and Todd (2005) defined the quality of the outputs using the DeLone and McLean information system success model, i.e., through four dimensions: relevance, accuracy, completeness, and format. A similar approach was used by Sulaiman and Ghanem (2016) to highlight the effect of controlling and information quality on organizational performance. Both Weißenberger and Angelkort (2011) and Fadhilah et al. (2015) examined the influence of controllers' output on decision-making (i.e., the impacts and benefits that managers gain from using the output), using either MAS characteristics or information quality to measure controllers' output quality.

Other research considered the direct impact of controllers on organizational performance, mostly using MAS characteristics as a measure of controlling quality (Ghasemi et al., 2015; Ismail et al., 2018; Ngo, 2021; Pedroso, Gomes, & Yasin, 2020). As Ismail et al. (2018: 49) stated and confirmed, "managerial use of MAS information could facilitate firms in making more accurate economic decisions, which could then positively impact organizational performance." Controllers provide decision makers with information that enables the setting of better objectives and standards, leading to better performance (Ghasemi et al., 2015). Organizational performance, i.e., enterprise performance, can be measured in terms of various aspects: real or perceived, financial and non-financial performance, market performance, customer perspective, operational excellence, overall performance, etc. Controlling is a function that coordinates and integrates all management functions, and thus is involved in decision-making at different organizational levels. That is, controllers' outputs consider suggestions for different aspects of organizational improvement. However, the ultimate goal of any enterprise is financial improvement, to which other performance aspects contribute. Therefore, the quality of controllers' outputs enables managers to contribute to the enterprise performance by making relevant and timely decisions. Therefore following hypothesis is proposed:

H2: *There is a positive and significant relationship between controllers' output quality and enterprise performance.*

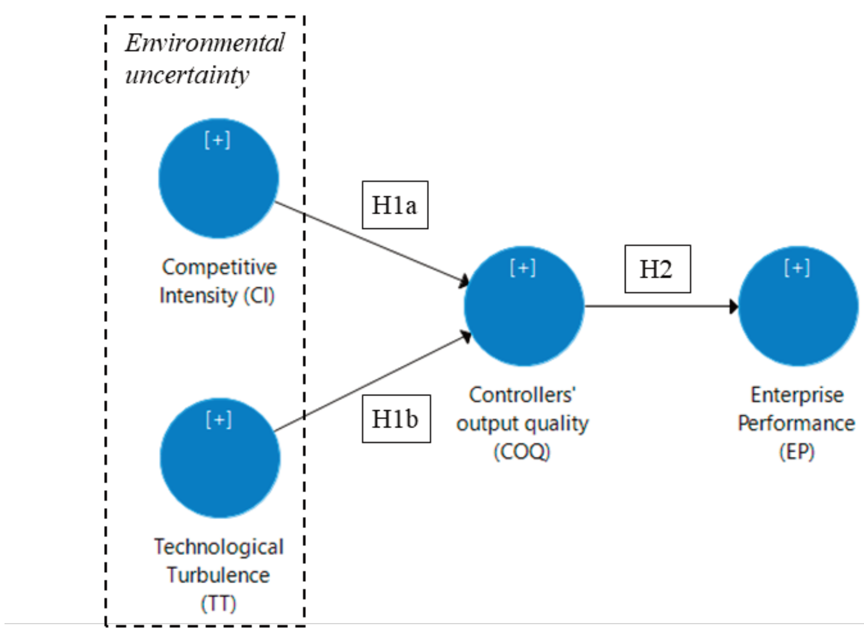
Based on the foregoing literature review, the aim of this study, and the defined hypotheses, a conceptual model is proposed (Figure 1).

3 METHODOLOGY

3.1 Data Collection and Sample

Data for this study were collected using a questionnaire developed based on existing and valid measurement scales. The questionnaire was subjected to pretesting. Four controlling experts were included to check the validity of the content, and a pilot study was conducted with respondents representing the target population of the study, i.e., controllers in the Republic of Croatia working in large companies. Because there is no database of Croat-

Figure 1: Research model with hypotheses



ian companies with a controlling department, and therefore no records of controllers, the starting point for creating our own database was the Lider Top 1000, a list of the top Croatian companies (in 2019). The questionnaire was sent via LinkedIn to controllers who had an active position in controlling in their profile. In addition, direct emails were sent to companies that were known to have a controlling department. The questionnaire was sent to a total of about 600 controllers, which was considered to be our own database of controllers in Croatia. However, because the questionnaire also was shared publicly on LinkedIn, the exact total number cannot be determined.

A total of 87 valid questionnaires were collected, a response rate of 14.5%, which is considered to be a representative research sample (Nitzl, 2018; Reinartz, Haenlein, & Henseler, 2009; Weißenberger & Angelkort, 2011). Additionally, according to the 10-times rule widely used in PLS-SEM, which assumes that the sample size should be greater than 10 times the maximum number of inner or outer model links pointing at any latent variable in the model (Hair, Hult, Ringle, & Sarstedt, 2017), the minimum sample size required for this research was 20 responses. The profile of the respondents is presented in Table 1.

The data were collected from controllers working in different types of organizations. Manufacturing companies accounted for the largest share, 40.2%, followed by wholesale and retail trade, i.e., repair of motor vehicles and motorcycles (20.7%); other organization types accounted for 10% or less. Most of the respondents were between 30 and 45 years old, and there were more female (56.3%) than male (43.7%) respondents. A total of 69% had a master’s degree, 13 controllers had an MBA, and 10 had a Master of Science degree. Most respondents (37.9%) had more than 10 years of experience in controlling; however, a large share also applies to those with less than 10, i.e., 5 years.

3.2 Measurement of Research Variables

This study adopted measurements from previous studies, with minor adjustments. A 7-point Likert scale was used for all constructs in the study.

Competition intensity. To measure the intensity of market competition of the companies in which the controllers worked, this study used the instrument of Jaworski and Kohli (1993) with some modifications made by Asare, Brashear, Yang, and Kang (2013) and Eker and Eker (2019), who used modified

Table 1: Profile of respondents

Variable	Category	Frequency	%
Age (years)	Less than 30	9	10.3
	30–45	53	60.9
	More than 45	25	28.7
Gender	Female	49	56.3
	Male	38	43.7
Education level	High school	2	2.3
	Bachelor's degree	2	2.3
	Master's degree	60	69.0
	MBA	13	14.9
	Master of Science	10	11.5
Experience in controlling (years)	Less than 5	26	29.9
	5–10	28	32.2
	More than 10	33	37.9
Type of organization (NACE rev. 2)	Agriculture, forestry, and fishing	2	2.3
	Manufacturing	35	40.2
	Electricity, gas, steam, and air conditioning supply	1	1.1
	Water supply; sewerage, waste management, and remediation activities	1	1.1
	Construction	3	3.4
	Wholesale and retail trade; repair of motor vehicles and motorcycles	18	20.7
	Transportation and storage	2	2.3
	Accommodation and food service activities	9	10.3
	Information and communication	8	9.2
	Financial and insurance activities	4	4.6
	Professional, scientific, and technical activities	2	2.3
	Other service activities	2	2.3

versions of the scale of Jaworski and Kohli (1993) in their own research. The variable was measured with a six-item instrument that respondents rated on a scale of 1 (strongly disagree) to 7 (strongly agree).

Technological turbulence. A slightly modified version of Jaworski and Kohli's (1993) scale also was used to measure the turbulence of technological change. The modification was also based on those by Asare et al. (2013) and Eker and Eker (2019), and on the theoretical knowledge of controlling. A 5-item instrument was applied, measured on a scale from 1 (strongly disagree) to 7 (strongly agree).

Controllers' output quality. Controllers were asked to rate the quality of the outputs (information in the form of reports, presentations, dashboards, oral counselling, etc.) they provide to their managers in terms of accuracy, timeliness, significance, form, and comprehensiveness. To measure this variable, we used a modified measurement scale from Weißenberger and Angelkort (2011), which was made according to Bauer (2002). The measurement scales of Wixom and Todd (2005) regarding information quality and of Ghasemi et al. (2016) regarding the MAS characteristic timeliness were used for the modification. A 10-item instrument was used to rate the controllers' output quality on a scale from 1 (strongly disagree) to 7 (strongly agree).

Enterprise performance. To measure the performance of the companies, controllers were asked to rate, on average, the performance of their company compared with that of competitors in the last 3 years. A 3-item measurement scale was used, which was an abbreviated version of the scale used by Pratono (2016). The respondents rated the items from 1 (has deteriorated significantly) to 7 (has improved significantly).

The specific items of each construct, including descriptive statistics, are presented in Table 2.

4 EMPIRICAL RESULTS AND ANALYSIS

In this study, partial least squares structural equation modeling in SmartPLS 3 software was used to analyze the respondents' data. PLS-SEM is a second-generation multivariate technique the application of which has increased significantly in recent years, and the application of which in the field of controlling is emphasized (Nitzl, 2016, 2018; Nitzl & Chin, 2017). Moreover, PLS-SEM allows the analysis of small sample sizes, and it is recommended for explanatory studies (Hair et al., 2017), which was the case in this paper.

PLS-SEM analysis includes two steps: (1) evaluation of the measurement model, and (2) assessment of the structural model. Reliability and validity of the theoretically defined constructs are determined by evaluating the measurement model, whereas assessment of the structural model (1) considers collinearity analysis within the structural model, (2) tests the significance and size of the impact of structural relationships between constructs, and, if suitable, (3) assesses the exploratory and predictive ability and its significance (Hair et al., 2017).

4.1 Evaluation of the Measurement Model

The evaluation of the measurement model assesses (1) indicator reliability, (2) convergent validity, (3) internal consistency reliability, and (4) discriminant validity of the constructs.

All indicators (items) of the evaluated model are reflective. Therefore, the reliability and validity of all items was confirmed by outer factor loading (Table 3). The loadings of almost all items were found to be above the recommended threshold of 0.70. Some indicators (CI3, CI5, TT1, COQ1, and COQ6) had loadings between 0.40 and 0.70 but because the average variance extracted (AVE) value of the constructs containing these indicators met the set threshold of 0.50, the indicators were not dropped. According to Hair et al., (2017) when an indicator has a value of less than 0.40 it needs to be dropped from the model, but if the value is 0.40–0.70, the AVE value determines the retention of the indicator in the model. The AVE values of all other constructs were greater than 0.50, Hence, the measurement model's convergent validity is acceptable.

The internal consistency reliability of the constructs was assessed based on the Cronbach's alpha (α) and composite reliability (CR). All the values of Cronbach's alpha and composite reliability were greater than the set threshold of 0.70 (Hair et al., 2017), suggesting that all constructs had acceptable reliability (Table 3).

A significant part of the analysis of reflective constructs is the analysis of discriminant validity. The literature recognizes three common approaches to examine discriminant validity: (1) the Fornell–Larcker criterion, (2) cross-loading, and (3) the heterotrait–monotrait (HTMT) criteria. Within PLS-SEM, the HTMT criteria is recommended (Hair et al., 2017; Henseler, Ringle, & Sarstedt, 2015). According to Henseler et al. (2015), HTMT values above 0.85 (or 0.90) indicate that discriminant validity has not been established. The results showed that the model of this study meets the condition of discriminant validity (Table 4). That is, all HTMT criteria had values less than 0.85. The results obtained for the Fornell–Larcker criterion and the cross-loadings confirmed this.

After the quality of the measurement model was confirmed, the structural model was evaluated.

4.2 Evaluation of the Structural Model

The evaluation of the structural model first considers the collinearity analysis within the structural model. Therefore, the structural model is tested for

Table 2: Descriptive statistics for constructs and items

Construct	Code	Item	Mean	Min	Max	SD	Ex.K	Skw
Competitive intensity (CI)	CI1	We are in a business with very aggressive competitors.	5.897	2.000	7.000	1.269	3.063	−1.760
	CI2	Competition in our business is cut throat.	5.816	2.000	7.000	1.369	1.558	−1.411
	CI3	Others can easily imitate products, services, and internal processes that a company has in our industry.	4.874	1.000	7.000	1.429	0.208	−0.760
	CI4	Companies are very aggressively making efforts to capture market share.	6.034	4.000	7.000	0.837	0.643	−0.905
	CI5	One hears of a new competitive move almost every day.	5.195	1.000	7.000	1.363	0.677	−0.833
	CI6	Price competition in this business is severe.	5.736	2.000	7.000	1.334	1.574	−1.420
Technological turbulence (TT)	TT1	Technology changes are very frequent in our industry.	5.034	1.000	7.000	1.466	0.678	−0.975
	TT2	Technological changes provide big opportunities in our industry.	5.667	3.000	7.000	1.100	0.298	−0.829
	TT3	A large number of new product and services have been made possible through technological breakthroughs in our industry.	5.736	3.000	7.000	1.066	0.519	−0.897
	TT4	Technological breakthroughs enable the creation of better business processes within the company.	5.782	3.000	7.000	1.011	0.868	−0.973
	TT5	Technological breakthroughs and innovations enable more efficient use of data in analysis and business decision-making.	5.977	4.000	7.000	0.884	0.080	−0.768
Controllers' output quality (COQ):	Information that I provide…							
	COQ1	covers all important fields of business activity.	6.046	5.000	7.000	0.623	−0.390	−0.032
	COQ2	reflects actual circumstances in a comprehensive and valid fashion.	6.046	4.000	7.000	0.677	−0.032	−0.283
	COQ3	reflects a high level of usefulness, explanatory power, and content.	6.080	4.000	7.000	0.665	0.150	−0.332
	COQ4	is very precise.	6.103	4.000	7.000	0.695	0.590	−0.562
	COQ5	is up to date.	6.207	4.000	7.000	0.729	0.398	−0.708
	COQ6	contains correct data/information.	6.356	5.000	7.000	0.606	−0.636	−0.373
	COQ7	is clearly presented.	6.287	5.000	7.000	0.545	−0.502	0.049
	COQ8	is aligned.	6.253	5.000	7.000	0.629	−0.617	−0.260
	COQ9	contains most relevant information.	6.253	5.000	7.000	0.591	−0.471	−0.141
	COQ10	is ensured through frequently reports (daily/monthly etc. or by request).	6.483	5.000	7.000	0.544	−1.011	−0.367
Enterprise performance (EP)	EP1	Gross profit	5.141	2.000	7.000	1.279	0.331	−1.110
	EP2	Sales	5.176	2.000	7.000	1.233	−0.158	−0.795
	EP3	Overall performance	5.274	2.000	7.000	1.087	0.971	−1.068

Notes: SD = standard deviation, Ex.K = excess kurtosis, Skw = skwenes

Table 3: Measurement model results

Construct	Code	Loading	α	CR	AVE
Competitive intensity (CI)	CI1	0.857	0.882	0.909	0.627
	CI2	0.781			
	CI3	0.694			
	CI4	0.820			
	CI5	0.691			
	CI6	0.888			
Technological turbulence (TT)	TT1	0.475	0.860	0.882	0.608
	TT2	0.892			
	TT3	0.911			
	TT4	0.773			
	TT5	0.770			
Controllers' output quality (COQ)	COQ1	0.666	0.915	0.929	0.568
	COQ2	0.789			
	COQ3	0.792			
	COQ4	0.838			
	COQ5	0.714			
	COQ6	0.665			
	COQ7	0.755			
	COQ8	0.759			
	COQ9	0.755			
	COQ10	0.787			
Enterprise performance (EP)	EP1	0.980	0.955	0.971	0.919
	EP2	0.983			
	EP3	0.910			

Notes: α = Cronbach's Alpha; CR = Composite reliability; AVE = Average variance extracted.

Table 4: Heterotrait–monotrait (HTMT) criterion

No.	Construct	1	2	3	4
1	Competitive intensity (CI)				
2	Controllers' output quality (COQ)	0.336			
3	Enterprise performance (EP)	0.050	0.174		
4	Technological turbulence (TT)	0.528	0.292	0.065	

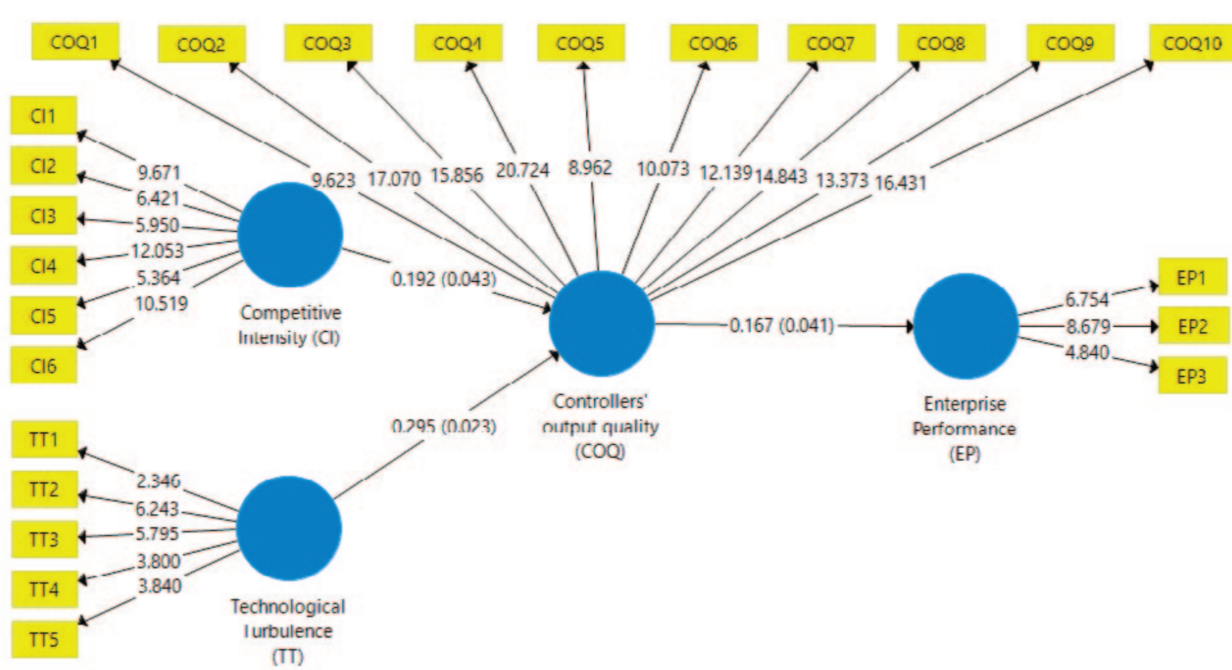
collinearity by examining each set of predictor constructs separately for each subpart of the structural model (Hair et al., 2017). For this, the inner variance inflation factor (VIF) is analyzed; the value should be higher than 0.2 and less than 5.0, and ideally close to or below 3.0 (Hair et al., 2017; Hair, Risher, Sarstedt, & Ringle, 2019). Because all the inner VIF values of the set model were below 3.0 (CI → COQ = 1.250; TT → COQ = 1.250; COQ → EP = 1.000), it can be concluded that the model meets the collinearity criterion and that there is no common method bias (Kock, 2015).

The second step in evaluating the structural model involves hypotheses testing, i.e., the assessment of the significance and strength of the relationships within the model. To compute the standardized beta values (*b*) of the path coefficients and to determine the significance of the relationship between the constructs, the bootstrapping technique was used (5,000 subsamples; two-tailed; $p \leq 0.05$; bias-corrected and accelerated (BCa) bootstrap).

The evaluation of the structural model revealed that the two set hypotheses [H1 (i.e., H1a and H1a) and H2] are supported (Figure 2). Each arrow between two constructs represents a hypothesized relationship, whereas the arrows between constructs and items represent the *t*-values of each construct item. Thus, the assessment confirmed a positive and significant relationship between competitive intensity and controllers' output quality (H1a; $\beta = 0.192$, $t = 2.029$, $P = 0.043$), technological turbulence and controllers' output quality (H1b; $\beta = 0.295$, $t = 2.266$, $P = 0.023$), and controllers' output quality and enterprise performance (H2; $\beta = 0.167$, $t = 2.043$, $P = 0.041$).

The third step of the structural model evaluation considers the assessment of the predictive ability of the model, including in-sample and out-of-sample prediction. The coefficient of variation (R^2) and the effect size (f^2) indicated a very weak in-sample prediction: 17.5% ($R^2 = 0.175$) of COQ was explained by CI and TT, and only 2.8% ($R^2 = 0.028$) of EP was explained by COQ. However, as stated by Hair et al. (2019), the acceptable value depends on the context and field of research. Falk and Miller (1992, in Streukens & Leroi-Werelds, 2016) stated that R^2 should be greater than or equal to 0.10, whereas Cohen (1988) considered a value of 0.13 to be moderate. In addition, R^2 is a function of the number of predictor constructs; the greater

Figure 2: Research model results of hypotheses testing



their number, the higher R^2 will be. In the set model, there is only one predictor construct for the final endogenous construct EP. For f^2, values above 0.02, 0.15, and 0.35 indicate weak, moderate, and strong effect sizes (Cohen, 1988). Effect size values assess how strongly an exogenous construct contributes to explaining a single endogenous construct in terms of R^2 (Hair et al., 2019). For COQ, CI had $f^2 = 0.036$ and TT had $f^2 = 0.085$. A value of $f^2 = 0.029$ was determined between COQ and EP.

For out-of-sample predictive relevance, the Stone–Geisserov Q^2 indicator was obtained using the blindfolding procedure (omission distance = 7). The Q^2 indicator explains whether the exogenous variables are significant in predicting the endogenous variables. A Q^2 value greater than zero indicates that the model has predictive significance of endogenous constructs (Hair et al., 2017). According to the cross-validated construct redundancy results, the Q^2 value of both endogenous constructs was greater than zero (COQ = 0.081; EP = 0.012), indicating that the model has predictive significance of the endogenous constructs.

5 DISCUSSION AND CONCLUSION

The economy of the 21st century undoubtedly is characterized by uncertainty due to rapid technological development and the desire to survive in a competitive global market. As a result of digitalization, decision makers have a vast amount of real-time data at their disposal that needs to be transformed into useful information. Controllers, as business analysts and advisors, support managers through their output—various analyses, reports, and suggestions. The quality of the output is related directly to decision-making and thus to enterprises' performance. This was the starting point of this paper. Our research has confirmed that there is a positive relationship between the uncertainty of the environment and the quality of the controllers' analyses and reports. Environmental uncertainty is defined and measured by two dimensions—competitive intensity, and technological turbulence. Currently, the intensity of competition is very aggressive, and companies are struggling to gain market share. The intensity of competition affects corporate success and the content of the controller's reporting. However, technological changes offer great opportunities that allow companies in different industries to improve and innovate processes and products, as well as to improve performance, by using new day-to-day, real-time-available data. In this research, a positive and significant relationship was confirmed between each of these two factors and the quality of controllers' output. That is, this research confirms the results of previous studies that highlighted the importance of the role of controllers in the decision-making process in an uncertain environment. It has been shown that the aggressiveness of competitors, i.e., price competition and the conquest of market share, is significantly related to the output quality.

Although previous research confirmed positive effects of competitiveness on the controller's role as an information provider (Ghasemi et al., 2016; Ghasemi et al., 2015; Ismail et al., 2018; Löfsten & Lindelöf, 2005), the results of the present study show that in terms of environmental uncertainty, technological turbulence has a stronger relationship ($\beta = 0.295$) with the controllers' output quality than does competitive intensity (Figure 2). This was expected. Controllers use available technological solutions for data collection and processing to produce useful information for the purposes of situation analysis and prediction. It also is to be expected that in companies that learn to constant process innovation and highly integrated information systems, controllers will have better availability of data and information, in terms of both time and quantity, which will have a positive impact on the quality of their work. Thus, controllers are dependent on the turbulence of technological development.

Controllers working in industries with a high rate of technological change are expected to keep up with the challenges these changes bring to their advisory role (e.g., to be able to find and process appropriate information that is changing faster than ever before), but these changes also provide them with more opportunities (e.g., to implement new and better analytical tools and business software, etc.). Therefore both the challenges and the opportunities can contribute to the quality of their work, i.e., output, which ultimately impacts business performance, as confirmed in this paper. This result is also in line with the findings of previous studies (Ghasemi et al., 2015; Ismail et al., 2018; Ngo, 2021), but is contrary to some (Pedroso et al., 2020). Furthermore, the effect of the involvement of controllers in decision-making has been proven before (Weißenberger & Angelkort, 2011; Zoni & Merchant, 2007), so it is expected that the use of high-quality controller outputs also will contribute to the company's performance. This research confirmed a direct relationship between the quality of controller output and enterprise performance. Thus, it was confirmed that the quality of outputs, which is ensured mainly by their preciseness, comprehensiveness, usefulness, exploratory power, and frequency, has a direct positive relationship with enterprise performance. However, future researchers should keep in mind that better performance of a manager, as a user of controller output, is associated with the performance of the enterprise (Chenhall, 2003; Pedroso et al., 2020).

Like other studies, this paper has limitations that should be considered by future researchers. The final sample of this study included survey results from 87 controllers from large companies in the Republic of Croatia. Although the applied method (PLS-SEM) supports smaller sample sizes, a higher response rate from controllers and extension to other countries would contribute to the validity and significance of the results. The results of the study may have applications beyond the Croatian context, especially in EU countries that have the same controlling concept. Moreover, many companies in Croatia that have controlling departments are subsidiaries of companies from EU countries. However, the share of these companies in the sample of this study is not known, so no generalization to other countries can be made. Furthermore, the proportion of industries in the sample also varied. Although, we do not think that this represents a problem for this research, it would be interesting to test the conceptual model among different industries.

Furthermore, because only controllers were surveyed in this study, to minimize common method bias, the entire model could be tested using managers' responses or by using a dyadic approach in which the controllers rate the constructs of environmental uncertainty and enterprise performance, and mangers rate the quality of controllers' output, in order to avoid self-rating. The results of this study show that, on average, controllers rated the quality of their outputs high ($\bar{x}$ = 6.211) and that this quality has a positive impact on their company's performance. However, it is not known whether managers hold the same view and whether they recognize the importance of the controller's role in decision-making. That is, would managers rate the quality of the controller's output the same, and would this rating also confirm the set hypothesis of this study? According to previous studies (Fadhilah et al., 2015; Weißenberger & Angelkort, 2011), it can be expected that the results of such a study would indicate same results. Managers who use and rely on controllers' outputs and accept controllers as business partners will contribute indirectly to the improvement of their output. In addition, it is to be expected that these managers in particular would participate in such a survey. Thus, involving managers who do not accept controllers as partners would undermine the results of the study, because the goal is to assess the quality of the outputs and the impact on a company's performance. Managers who do not use controllers' outputs are not in a position to assess their quality at all. Thus, one can assume that managers who value the controller's profession might even give a higher rating than the controller.

It was not the aim of this paper to evaluate indirect and mediating effects, but these should be considered in further research. Researchers also could contribute in the future by using other measurement and construct setting approaches. For example, environmental uncertainty could be specified as a high-order construct, or the quality of controller outputs could be measured with a different set of items. In addition, financial indicators such as return on assets and return on equipment, or earnings before interest, taxes, depreciation, and amortization, could be used to measure the construct of enterprise performance. Control variables were not included in this study. However, future research should consider the influence of controllers' profiles, such as age and gender or years of work experience, in controlling and similar jobs, as well as educational level. Therefore, partial least squares multigroup analysis (PLS-MGA) should be used to test for significant group differences, or a single-item approach could be used instead to examine the effects of the control variables on the model separately or simultaneously.

The results of the study confirmed the importance of involving controllers in the decision-making process, in terms of their informative and advisory role. That is, the study confirms that the quality of outputs can have a direct impact on the performance of an organization. Therefore, controllers must take into account that the uncertainty of the environment, i.e., the intensity of competition and technological turbulence, are factors that can significantly affect the quality of their work. However, the results should be considered first and foremost by managers. It is well known that even now controllers have to make great efforts to maintain their position in the decision-making process, that is, to gain their role as business partners. These results should help bridge the gap between controllers and managers, and contribute to the controllers' profession.

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EXTENDED SUMMARY/IZVLEČEK

Negotovost okolja, hiter tehnološki napredek in splošna intenzivnost konkurence prispevajo k vse večji potrebi po povezovanju kontrolerjev in managerjev v procesih odločanja. Kontrolorji, kot poslovni analitiki, vedno bolj delujejo kot svetovalci, zato odnos med njimi in managerji postaja vse bolj partnerski. Kontrolorji na podlagi številnih podatkov izdelujejo različne analize in poročila, zato je v času velikih podatkov njihova kakovost vse bolj pomembna. Namen prispevka je bil dokazati, da obstaja pozitivna povezava med negotovostjo v okolju in kakovostjo rezultatov kontrolorjev, ter da kakovost rezultatov kontrolorjev vpliva na dosežene rezultate pri poslovanju podjetja. Rezultati raziskave zbranih od 87 kontrolorjev iz velikih hrvaških podjetij so bili uporabljeni za dokazovanje povezave med intenzivnostjo konkurence in tehnološkimi turbulencami ter kakovostjo rezultatov (poročila, analize, informacije, predlogi itd.) kontrolorjev ter razmerja med njihovimi donosi in uspešnostjo podjetja. Za testiranje modela je bilo uporabljeno delno modeliranje strukturnih enačb najmanjših kvadratov (PLS-SEM). Rezultati kažejo, da okoljska negotovost, to je intenzivnost konkurence in tehnološke turbulence, pozitivno in pomembno vpliva na kakovost donosov kontrolorjev. Ker njihovi donosi predstavljajo osnovo za odločanje, kontrolorji vplivajo tudi na učinkovitost delovanja podjetja. Ugotovitve podpirajo novo paradigmo o potrebi po svetovalni vlogi kontrolorjev prek partnerstva z managerji.

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