



Original research article

Intellectual capital determinants of customer value added in a transitional economy: An unconvincing role of knowledge supportive technology

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ABSTRACT

This study investigates whether and how a firm's utilization of knowledge management-supportive information technology (IT) moderates the effects of three-partite intellectual capital on customer value and, further, market performance. We draw on a combination of thus-far isolated literature streams namely: intellectual capital, technology-based knowledge management, and marketing to build a research model, which is tested on a survey of firms in the transitional economic context of Serbia. The survey data is analyzed using structural equation modelling-partial least squares (SEM-PLS). The results show that structural capital and relational capital have a positive effect on customer value, which further positively affects market performance. Surprisingly, IT practices may even decrease the extent to which an organization produces value for its customers by capitalizing on its intellectual capital. Our findings demonstrate that technological excellence cannot solve everything and that an optimal balance between "tech" and "human-based" resources must be found for superior customer value added. This brings an interesting nuance to the discussion concerning the interaction between knowledge resources and technological capabilities in facilitating performance. The findings also demonstrate that heavy reliance on IT-based knowledge management in certain economic contexts may backfire with respect to a firm's customer value and eventually deteriorate its performance.

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1. Introduction

The value created for customers and the ability to manage it have been recognized for a long time as one of the drivers of competitive advantage [1]. However, in a knowledge-based and digitalized economy the concept of customer value creation has been transforming [2], [3]. First, knowledge has become a critical

input to value creation processes [4]. The dual nature of knowledge emphasizes the importance to discuss the impact of both knowledge-based resources (i.e. Intellectual Capital (IC) and Knowledge Management (KM) processes on customer value creation) [13], [14]. Whereas a firm's existing knowledge base sets up its scope and ability to understand market and customers [3], KM enables companies to use what they know for decision-making, problem-solving, and innovation

[14] for customers [4]. Second, digitalization has fundamentally changed the interplay between companies and customers [5-6] including the roles that the company and customers have in the value creation process [2], interactions between the company and the customer [7], as well as how the value is created in customer relationships [8]. The latest technology also enables companies to support customer value creation in novel ways [9], [10]. In today's digital, open, and co-creative economy, customers are no longer passive recipients but empowered knowledge partners [11]. They have shifted from mere consumers to co-creators and co-developers of knowledge and competencies [12]. By contributing substantially to what companies know and actively joining value and innovation co-creation [3], customers have become closely integrated with organizational IC and KM.

Information Technology (IT) enables firms to better leverage existing resources, meet rising customer expectations, and build strong, lasting customer relationships [15], [16]. It helps companies gather and use knowledge about and from customers, make better decisions, co-create products and services, and reach customers more effectively [17]. IT supports collaborative and co-creative environments [18] and facilitates knowledge processes [19]. Consequently, IT systems are widely viewed as tools that enhance KM capabilities [20]–[22]. This technology-based dimension of KM is often described as IT practices [23], [24], meaning intentional managerial activities that use IT to manage knowledge within and beyond organizational boundaries. Although understanding what creates value for customers becomes critical for a company's success in the knowledge-driven and digitalized world, the drivers such as IC and technology-based KM remain under-researched. Despite the well-developed conceptualizations of IC, KM, and customer value creation [13], [25], research on the intersection between IC, KM, digitalization, and customer value creation is still emerging [2].

There are several gaps in the literature. First, IC and customer value have largely been studied separately, with limited attention to their interconnections [26] and little strong empirical evidence [3]. Second, research linking KM and customer value creation has focused on internal knowledge processes [4], customer KM models [11], and extending KM efforts to include customers [3]. Third, although knowledge-based customer value depends on both IC and KM, these perspectives remain insufficiently integrated. IC research focuses on knowledge resources, while KM focuses on dynamic capabilities—including IT-related ones—for managing knowledge resources [13]. De-

spite IC being clearly shaped by its management context [13], [14], very few empirical studies combine IC and KM approaches [27]–[29]. As a result, the literature still lacks a detailed understanding of how IC and technology-based KM jointly influence customer value and market performance. Finally, findings on technology integration in KM are mixed and fragmented [28]. Some studies show that greater IT integration enhances a firm's ability to create, absorb, transfer, integrate, and leverage knowledge [30], [18]. Others caution that increased technology use can create rigidity [31] and weaken customer relationships. Technology may either enable or hinder communication, collaboration, and tacit knowledge sharing between firms and their customers [32].

To bridge these gaps, the present study aims to understand how organizational knowledge resources and technology-enabled KM capabilities together affect customer value and market performance. We follow recent theoretical discussions about the conceptual differences between IC and KM [13] and examine IC as a potential resource for value creation that requires certain IT-based organizational capabilities [33], [24] for managing internal and external knowledge to ultimately increase performance and operate effectively in the market [30]. We argue that the role of technology in boosting customer value and market performance is mainly due to the improved knowledge-handling capacity it brings to the organization. With IT practices, firms can more effectively and efficiently acquire, share, and create new knowledge and apply it in their marketing activities and customer relationship management. We further assert that the better an organization uses technology to renew and manage its knowledge, the more value it can derive from its knowledge base [13]. Thus, organizational IT practices are expected to function as moderators in the relationship between IC and customer value creation. The research questions are: (1) What are the key IC dimensions associated with customer value creation and, further, with market performance? (2) How and to what extent do IT practices change the nature and strength of the effects of IC on customer value and market performance?

Our study contributes to the literature in several ways. First, we show how static knowledge resources and technology-integrated dynamic knowledge processes jointly influence customer value creation and market performance. This combines frameworks that have so far been studied mostly in isolation, with IT integration examined either in KM [24], [27] or marketing research [15], [34], but rarely alongside IC. Second, we extend the IC–performance literature

by explicitly including market performance, as most prior work has focused on overall or innovation performance [35]. We also build on studies that analyze IC dimensions separately by examining their distinct effects on customer value and market performance [36], [26]. Third, we test whether IT use in KM moderates the IC–customer value and IC–market performance relationships. This helps clarify how and to what extent technology-enhanced KM can strengthen or alter the impact of IC, and how firms can better leverage their IC through KM technologies. Fourth, we test our framework in the under-researched transitional economy of Serbia, where IC structures and managerial views differ from those in post-industrial economies [37]. Serbia’s ongoing transition increases managerial risk aversion [38], while its fast-growing IT sector—now 6% of GDP [39]—creates opportunities for improving IC management. This context allows us to examine theories largely developed in mature Western markets [36] within a different economic setting.

2. Theoretical background and hypothesis development

2.1 Intellectual capital as a builder of customer value and market performance

IC refers to the overall stock of knowledge-based resources that an organization can potentially use in its value creation process [13], [24]. Many IC elements, such as trademarks, brands, image, and advertisements, are marketing- and customer-related and present the know-how used to attract and retain customers [40]. Although there are various IC classifications in the literature, we follow the three-dimensional categorization of IC—consisting of human, structural, and relational capital—as it has become an emerging standard [35] and useful taxonomy in many business contexts [41]. Creating superior customer value is essential for company success [25], [42], [43]. Firms are competitive when they deliver greater value than their rivals [42]. Although customer value is multidimensional [25], we build on the benefit/cost ratio model [43] and Woodruff’s definition [42] of customer value as the customer’s perceived evaluation of product attributes and their ability to support goal achievement. Customer value is a subjective, context-dependent experience [44], formed dynamically during product and service use [2], [45]. Recent marketing literature therefore views it as value-in-use rather than value embedded in a product [46].

Digitalization and service/customer-dominant logic [17], [46], [47] have shifted the locus of value creation and changed the roles of firms and customers [2], [25]. These perspectives highlight value co-creation, customer subjectivity, and the importance of customer contexts and experiences [2], [25], [47], [48]. Customers co-create value as they integrate resources during interactions with firms, linking organizational resources, IC, and customer value. What customers co-create becomes their perceived value [25], [49]. Increasingly, value creation occurs in customer-selected contexts rather than firm-controlled ones [17]. In today’s global, networked markets, customers generate value through their own social interactions, wherever they are [50], meaning value often emerges independently of direct company involvement.

Customer value is related to—but distinct from—market orientation and market performance [51–52]. Market orientation concerns how a firm generates and shares market intelligence [51], while customer value is the result of applying that intelligence [52]. Market performance refers to achieving goals such as sales, revenue, market share, profitability, competitive advantage, customer loyalty, or satisfaction [51]. Customer value reflects not only product and service attributes but also how well a company understands customer needs, supports their perceptions and emotions, and responds to their inquiries. In the knowledge economy, value is created by embedding knowledge into products and services [3]. What customers experience is this embedded knowledge, inseparable from employees’ skills, experience, commitment, and relationships. Thus, customer value has been linked to employees’ expertise, professionalism, customer commitment, and relationship value [49], [3]—all components of organizational IC. This highlights the direct influence of IC on customer perceptions and value.

We will now proceed to hypothesize how the IC dimensions affect customer value creation. Human capital (HUMCAP) refers to an organization’s employees and their intangible attributes, such as their expertise, hands-on experience, skills, and motivation [53]. As company employees produce the goods and services, they are in a key position to impact the value customers perceive in interacting with the firm. Employees’ non-substitutable creativity [54] and knowledge about products and services, customers, and competitors significantly impact customer perceptions of the brand and firm [55], thus influencing the firm’s competitive advantage. Furthermore, employees directly and indirectly observe customer be-

aviors and reactions [6] as well as impact customer perceptions about service quality [56]. For example, salespersons' customer orientation, which belongs to HUMCAP, has significant effects on customer trust [58] and customer satisfaction [56], important parts of customer value.

H1a: Human capital positively influences customer value

Structural capital (STRUCAP) consists of "all the non-human storehouses" of knowledge within an organization [57]. STRUCAP represents the knowledge accumulated and distributed through firm structures and processes (e.g. cultural traits, processes, and systems) [53]. This collective knowledge enables a wider and deeper stock of solutions and methods for solving customer problems. Firm processes have been shown to affect the creation of customer value and market performance [59]. Well-honed processes and functional technologies are likely to enhance R&D capabilities [60], facilitate new product development [27], and increase customer responsiveness [26]. Thus, greater STRUCAP may not only expand customer benefits but also reduce both the costs they take on as well as firms' operating costs and, in this way, increase customer value and market performance [61], [59].

H1b: Structural capital positively influences customer value

Relational capital (RELCAP) represents the value of knowledge embedded in a firm's web of relationships [53]. It concerns the structural, relational, and cognitive aspects of the firm's relationships with its key internal and external stakeholders [62]. Access to a wide network of trustful and reciprocal relationships ensures a smooth flow of knowledge within and across organizational boundaries [29], enabling the utilization and spread of knowledge to meet customer needs. Thus, RELCAP may significantly improve customer value creation through not only the extended potential for combining and exchanging knowledge, but also through the potential for creating new knowledge [62]. For example, on the front line of any business, customers offer to share their experiences, suggestions, and stories, that in the case of trustful relationships with the company might give impetus to new ways of thinking about work and learning within the company [3]. A firm's interactions with stakeholders add agility to the value creation process [63], improve employees' problem-solving abilities, help them better understand customer expectations, and improve the quality and functionality of their products and ser-

vices or provide new solutions to meet market needs. Building and managing profitable customer relationships—the key role of marketing—also represents a part of RELCAP that directly affects the delivery of superior customer value and satisfaction [55].

H1c: Relational capital positively influences customer value

We also assert that customer value has an impact on the overall market performance of the firm, because the ability to increase the perceived value for the customer has become a differentiation tool that helps companies better satisfy customers' needs and increase their satisfaction, commitment, trust, and loyalty [64]. Customers who perceive the products and services offered by a firm as creating value are likely to purchase them [65], be willing to pay a higher price for them [66], provide positive word-of-mouth endorsement to other potential customers [67], and demonstrate a higher level of loyalty and satisfaction [68], all of which contribute to superior market performance.

H2: Customer value positively influences the market performance of the firm

2.2 Information technology practices, intellectual capital, and customer value

In our study, we focus on the extent to which IT systems are used in facilitating IC and knowledge processes, and whether they are supported by appropriate managerial activities [21]. It should be noted here that what is important in this work is not the mere existence of advanced technology in companies, but their usability and usefulness for supporting IC and KM to create superior customer value. Thus, we refer to *IT practices as technology-based dimension of KM and define it as systematic and deliberate managerial activities to use IT to leverage knowledge-based resources and facilitate knowledge processes* [21], [13], [29]. In order to cope with increasing online information that are available through various digital channels companies adopt advanced IT practices, as technological solutions can facilitate the extent to which an organization is able to produce value for its customers by capitalizing on its IC [20].

For example, through application of technological innovations (artificial intelligence - AI, service robots, chatbots, webinars, blogs) in KM, the company may better engage their employees in customer value creation, stimulate connectivity, collaboration,

and knowledge co-creation within the company as well as between the company and the customers [69], [70], which further may enable the company to know the customer better, to reach customers faster, and to communicate their feedback within the company more efficiently; it also provides focused communication through personalized AI-driven website views, chatbots, and newsletters, and enables quick response to unanticipated customer demands or to their concerns through social media or service robots [29]. Technology-based KM enables companies to empower customers as knowledge partners and stimulates new ways to engage customers in knowledge transfer and value co-creation with IC [2], thus intensifying and enhancing customer experience and perceptions [71]. Accordingly, we suggest that a wide range of advanced technology in KM helps companies to apply their IC in serving customers and delivering value to them more effectively and efficiently. Hence, the utilization of IT to manage organizational knowledge moderates the organizational ability to derive customer value from the IC dimensions [13]. We next proceed to argue how this association plays out for each IC element.

Starting with HUMCAP, the increased utilization of IT enhances its influence on customer value, because, for instance, technology improves employees' knowledge productivity [72]. Intranets are used to enhance employee access to information and learning and provide collaborative tools for knowledge-sharing [73]. IT facilitates just-in-time learning [22] based on corporate chats, forums, and online libraries, and, through this learning, employees are able to adapt rapidly to changing customer needs, increase customer responsiveness, and thus serve customers better. Moreover, there are technologies that help employees reduce both the time and cognitive load associated with transforming knowledge into customer value [74] and improve their focus on the customer by synchronizing activities and information flow throughout the organization [15]. "Due to services' real-time production, new services go hand in hand with modifications of the service delivery process and changes in frontline employees' skills" [75, p. 242]. Similar studies found a positive influence of HUMCAP on supply chain performance, including a positive moderation of IT capabilities [76].

H3a: IT practices positively moderate the association between human capital and customer value

The utilization of IT helps companies build organization-wide customer databases, integrate valuable information coming from their customers with other

customer records [15], re-utilize the solutions previously made, and, thus, increase the overall organizational efficiency in meeting customer-expressed and latent needs [77]. Although IT represents a major type of assistance in the storage and retrieval of organizational memory [21], new technology (e.g. web-based information systems, online social networks) also acts as a platform that fosters valuable knowledge about and an increased responsiveness to customers [61]. Moreover, extranet technology provides customers with a direct interface to organizational resources while providing employees with a rich set of information about customer demands [15]. Hence, IT practices are likely to positively leverage STRUCAP to create customer value [13].

H3b: IT practices positively moderate the association between structural capital and customer value

Finally, IT utilization can be expected to increase the extent to which an organization is able to produce value for its customers by capitalizing on its RELCAP, as there are technologies that improve customer-firm interactions and information-sharing [15] and increase the rate at which knowledge from outside and inside the organization can be transferred to those working on an issue so they can use it in problem-solving [74]. For example, through IT application, a firm is able to better know the customer, reach customers more efficiently, communicate customer feedback within the company more efficiently, provide targeted communications (e.g. personalized website views and newsletters) for customers, and respond quickly to unanticipated customer demands or concerns in a more timely manner (e.g. through social media or service robots). Moreover, technology is a platform of Customer Relationship Management (CRM), as it helps companies in analyzing their customer base and differentiates customer relationship-related managerial actions to maximize customer value [34]. We thereby assert:

H3c: IT practices positively moderate the association between relational capital and customer value

The research model is presented in Figure 1. Figure 1 summarizes the theoretical model developed in the preceding sections by integrating the key constructs and illustrating their hypothesized relationships. By consolidating the argument into a single framework, the figure provides an overview of the model's internal logic and clarifies how the individual components jointly explain the phenomenon under study.

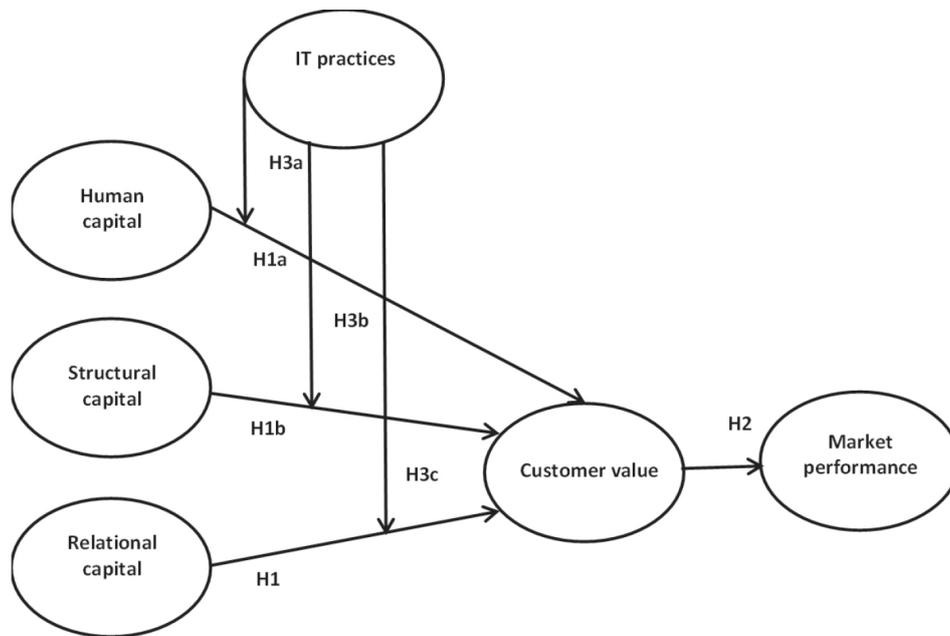


Figure 1. Research model

3. Research design

3.1 Data collection and sample

The population of the companies included in this study is based on publicly available data derived from the Statistical Office of the Republic of Serbia, Chamber of Commerce and Industry of Serbia, and Serbian Business Registers Agency. We focused on companies with more than 100 employees, as we assume that large companies could provide more comprehensive knowledge-supportive IT practices. Out of 2,500 eligible companies, 250 were contacted. In line with [14], we used a convenience sampling method to select the companies. This sampling approach was justified, because we targeted the director and other top management team members who are notoriously difficult to contact. Our data collection is based on a questionnaire survey. To increase the response rate, the survey design and administration followed Dillman's tailored design method [78]. Accordingly, the questionnaire was pilot tested before being sent out by a panel of academics and practitioners to ensure face validity. The constructs have been based on previous well-established studies in as will be elaborated in section 3.2. Accordingly, the panel's feedback only resulted in minor changes related to wording of some questionnaire items. Furthermore, an online survey was sent out only after personal contact was first established either via phone or email to develop a sense of trust, which is essential for surveys

conducted in emerging and transitional economies. Accordingly, the director of each company was initially contacted via email and phone, through which the survey objectives were explained, and confidentiality ensured. The second point of contact initiated the data collection via an online survey to develop a sense of trust. Over a period of three months—from February 2023 to May 2023—we received a total of 101 responses. This is in line with other studies in the field in which the high-level management is the target population [29], [79]. The sample characteristics are summarized in Table 1.

Table 1. Sample characteristics

Indicator	Frequency
<i>Firm size (number of employees)</i>	
< 250	37
251–600	30
> 601	34
<i>Firm Age</i>	
< 16 years	32
17–20years	28
> 21years	41
<i>Location</i>	
Belgrade	42
Other	59
<i>Industry</i>	
Manufacturing	55
Service	46

To minimize common method bias *ex ante*, several steps have been taken at the research design stage. First, the constructs have been distributed in a non-systematic manner across the questionnaire. Furthermore, our model includes complex moderation effects, both is making it unlikely for the respondent to guess our model [80]. Second, we also varied the anchoring of our constructs for instance “1 = very poorly, 5 = very well” or “1 = completely disagree, 5 = completely agree”. Third, we clearly separated the constructs spatially on the questionnaire. Furthermore, we employed *ex post* tests to detect common method bias in our dataset. In particular, we investigated variance inflation factors (VIF) and an additionally conducted Harman one factor test. Neither result showed any severe issues with common method bias. For instance, Harman one factor test result was below the suggested benchmark of 50% of a single factor loading [81]. The analysis of the variance inflation factors (VIF) was generated via a full collinearity test [82]. The highest VIF value for the main variables was 2.992, which is below the conservative threshold of 3.3. Hence, common method seems not at major threat to the interpretation of our data.

3.2 Measures

We used well-established constructs to measure the variables to increase reliability and comparability. HUMCAP and STRUCAP were adapted from [83]. Internal RELCAP and external RELCAP were adapted from [84] and aggregated into one RELCAP construct. Customer value creation (CUSTVAL) was adapted from [85]. IT practices (ITP), a six-item construct, was adapted from [24]. Market performance (MARKPER) was based on subjective measures adapted from [86]. Subjective performance measures have been shown to increase response rates. This is especially crucial in our context given that firm-level surveys are still rather uncommon in Serbia. Furthermore, subjective performance measures are reliable indicators of firm performance [87]. The full details of the questionnaire can be found in Table 2 (see Appendix A).

4. Analysis and results

4.1 SEM-PLS

We analyzed our data using a partial least squares approach to structural equation modelling (PLS-SEM). PLS-SEM was used here given the mixed em-

pirical evidence reviewed earlier; we also believe that theory-building is as important as theory-testing alone, which could be more appropriately done using a covariance-based structural equation modelling (SEM) method [88]. PLS-SEM is also able to handle multiple latent and manifest variables, as required in our model [88], [89]. Moreover, the PLS-SEM approach is more robust against potential data inadequacies [90]. PLS-SEM is also seen as more suitable when sample sizes are smaller [91]. For instance, covariance-based SEM methods often require sample sizes of 250 or more to provide robust insights [92]. However, this is not the case for PLS-SEM which shows much more robust insights based on sample size even below 50 cases [93], [94]. Furthermore, concerning the sample size, the required sample size was assessed using inverse square root method and gamma-exponential method. In line with current practices in the field [92], [94] we set the minimum absolute significant path coefficient in the model to 0.250, the significance level used to 0.05, and the power level required to 0.800. Based on our model specifications, the minimum sample size required based on the inverse square method was 99 and based on the gamma-exponential method 86. Hence, we can conclude that our sample size is sufficient to conduct our statistical analysis. We used WarpPLS 6.0 software for data analysis.

4.2 Measurement model

We used confirmatory factor analysis to establish construct reliability and validity. The factor loadings were well above the commonly applied threshold of 0.5 [90]. This also meant that we did not have to drop items. The composite reliability, Dijkstra's reliability, and Cronbach alpha values were above the 0.7 threshold [89-90]. Composite reliability values ranged from 0.888 for market performance to 0.943 customer value creation. The average variance extracted was above 0.5 and the model could hence be deemed satisfactory in terms of convergent validity. Following [95] we assessed discriminant validity by ensuring that the square root of the average variance extracted (AVE) was higher than the correlation between the constructs. This was the case for all constructs. As recommended [89], we also assessed the heterotrait-to-monotrait (HTMT) ratio. The values were largely within the recommended thresholds and are available from the authors upon request. Furthermore, none of the variance inflation factor values were alarmingly high, suggesting that multicollinearity was not a major issue for our dataset. The full results are presented in the correlation matrix in Table 3.

Table 3. Correlation matrix and AVE

		Mean	SD	1	2	3	4	5	6
1	CUSTVAL	3.97	0.69	0.839					
2	MARKPER	3.56	0.73	.775**	0.852				
3	ITP	4.06	0.80	.567**	.413**	0.843			
4	STRUCAP	3.97	0.75	.578**	.521**	.772**	0.838		
5	HUMCAP	3.82	0.74	.538**	.544**	.457**	.502**	0.871	
6	RELCAP	3.89	0.70	.712**	.602**	.621**	.663**	.804**	0.805

Note: **Correlation is significant at the 0.01 level (2-tailed).

4.3 Structural model

The structural model tested the statistical significance of our hypotheses. We chose a stable path coefficient estimation method to assess the statistical significance of the path coefficients [96], as a stable method does not rely on the replication of samples alone and produces stable path coefficients [97]. The structural model results are summarized in Table 4.

The R-squared values were 0.73 for customer value creation and 0.61 for market performance. The path coefficient between HUMCAP and customer value creation was positive ($\beta = 0.034$) but not significant ($p = 0.323$); between STRUCAP and customer value creation was positive ($\beta = 0.235$) and significant ($p < 0.001$); and between RELCAP and customer value creation was positive ($\beta = 0.577$) and significant ($p < 0.001$). Hence, Hypothesis 1a is not supported, while Hypotheses 1b and 1c are supported. The path coefficient between customer value creation and market performance was positive ($\beta = 0.784$) and significant ($p < 0.001$); thus, Hypothesis 2 is supported.

We also tested for the moderating effect of IT practices on the associations between the IC dimensions and customer value creation. We found that IT practices negatively moderate the associations between HUMCAP ($\beta = -0.110$, $p = 0.129$), STRUCAP ($\beta = -0.059$, $p = 0.275$), and RELCAP ($\beta = 0.028$,

$p = 0.388$) and customer value creation. The sign was opposite of what we expected in Hypotheses 3a and 3b and not significant in all of them. Therefore, hypotheses 3a to 3c are not supported.

We also assessed the overall fit of our model. The customarily applied indicators were all well within the range of the commonly accepted thresholds. For instance, the average block variance inflation factor was 4.839, which is smaller than the recommended upper threshold of 5 [96]. The same was true for the average full collinearity variance inflation factor, which was 4.202. Both of these findings indicated acceptable levels of overall multicollinearity. Furthermore, the Tenenhaus goodness of fit index was 0.736 in our model, indicating a strong explanatory power. The standardized root mean squared residual (SRMR) was 0.097; as it was below 1, it was in an acceptable range [89]. The model fit results are presented in Table 5 (see Appendix B).

5. Discussion

Our model postulated that IC components positively impact customer value (H1a-c), which in turn increases market performance of the firm (H2). We further proposed that IT practices positively moderate the relationships between IC and customer value

Table 4. PLS results

	Path coefficient	P-value	Hypothesis supported
Hypothesis 1a: HUMCAP and CUSTVAL	0.032	0.323	No
Hypothesis 1b: STRUCAP and CUSTVAL	0.235	<0.001	Yes
Hypothesis 1c: RELCAP and CUSTVAL	0.577	<0.001	Yes
Hypothesis 2: CUSTVAL and MARKPER	0.784	<0.001	Yes
Hypothesis 3a: HUMCAP *ITP and CUSTVAL	-0.110	0.129	No
Hypothesis 3b: STRUCAP *ITP and CUSTVAL	-0.059	0.275	No
Hypothesis 3c: RELCAP *ITP and CUSTVAL	0.028	0.388	No

(H3a-c). While examining the direct influence of IC components on customer value, we found STRUCAP (H1b) and RELCAP (H1c) to be positively associated with customer value, with RELCAP being the strongest predictor. Customer value, by definition, is externally oriented. Therefore, RELCAP is conceptually closest to customer value, encompassing customer trust, loyalty, partnerships, and brand reputation. Our findings indicate that well-functioning internal and external collaboration adds agility to the company's value creation network [63], improves market knowledge acquisition [98], facilitates a more rapid response to the unpredictable opportunities arising from the market [99], and enables the company to create more value for its customers [34]. We also showed that connectivity to networks, related knowledge accessibility, and a company's image facilitate customer value creation [100] and market performance [101]. Furthermore, it was confirmed that collective knowledge of the firm enables a wider and deeper stock of solutions and methods for solving customer problems [27] and functional structures and processes help to produce added customer value [59].

However, we could not confirm the direct influence of HUMCAP on customer value creation (H1a). It is likely that HUMCAP drives the other IC components, but, in our sample, it alone had no direct relationship with customer value. HUMCAP may improve internal capabilities or innovation potential, but without strong organizational systems and market-oriented networks, this potential does not directly translate into customer-perceived value. For instance, employees' skills, knowledge, and creativity only become valuable to customers when supported by organizational processes (STRUCAP) and relationships (RELCAP) that translate knowledge into products, services, or experiences customers can perceive. Similar patterns have been identified in adjacent studies [102]. Our findings, however, differ from [26], who found all IC dimensions as driving customer value in Finnish companies, with the strongest influence made by HUMCAP. However, companies in transitional economies may still rely on hierarchical structures, having limited employee empowerment, and weak customer orientation, so employees' knowledge and skills are not fully leveraged in customer value and experience. As expected, customer value was positively associated with the firm's overall market performance (H2).

Contrary to our expectations, the utilization of IT in KM was not found to increase the impact of any of the three IC components on customer value creation. Thus, hypotheses 3a, 3b and 3c were rejected.

This is in line with [34] and [103], who did not find a positive effect of a technology orientation on market performance, as well as with other studies [31-32] suggesting that managers should not solely pursue technological excellence. Overall, moderation findings suggest that IT practices do not condition or amplify effects of IC dimensions on customer value in the studied context.

This lack of a boosting effect from IT might indicate that IC could be more important than technology in serving customers' needs. This might be especially true in after-sales, which requires more human interaction that cannot be provided solely by IT. It also implies that employees better understand how to satisfy customer needs as compared to rigid IT-based solutions [6], [104]. This has also been indicated in the studies by [105] and [19], who showed that the rigidity of IT systems has a detrimental impact on the agility of firms and their performance.

In transitional economies, organizational cultures are still shaped by post-socialist legacies, featuring hierarchical decision-making, risk aversion, and low market orientation. Even when advanced KM technologies are introduced, technology alone cannot compensate for a lack of knowledge-sharing culture; it may even reinforce existing silos if used merely as an administrative or reporting tool. KM initiatives are often ad hoc, as many firms lack formal KM strategies that effectively integrate knowledge in value creation processes. Technology supports data storage and reporting, but does not strategically integrate employee know-how, organizational routines, and stakeholder relations into a coherent system that drives customer value. Although, it is expected that the fast development of the IT sector in Serbia has created a push for the digital transformation of other sectors as well, data has shown that companies in other industries do not invest sufficiently in IT [106] and face significant shortages in terms of the skills and competences crucial for digital transformation [39]. Even when new technologies are adopted, insufficient training and lack of digital literacy among employees reduce actual utilization of technology in value creation for customers. In general, firms in transitional and emerging economies rely to a larger extent on personal networks in lieu of more market-like transactions that could be more efficiently conducted via appropriate IT infrastructure [107]. This is confirmed in [109], who found that one of the biggest obstacles to successful digital business transformation in Serbia is the prevailing misconception among management and employees that purchasing and installing digital solutions alone constitutes transformation. This results in

insufficient attention being paid to employee readiness, the organizational culture and leadership support [110]. Consequently, even when IT practices are formally present, their integration into knowledge-related processes remains superficial [111].

6. Conclusion

This paper examines which key dimensions of IC are associated with customer value creation and market performance, and whether IT practices change the nature and strength of these relationships. We posited that the IC dimensions have a positive effect on customer value and market performance and that this effect is positively moderated by IT practices. However, our findings demonstrated that, while IC indeed improves customer value, IT practices do not bear a positive moderating impact.

6.1 Theoretical and methodological implications

First, in response to calls for more holistic theoretical and practical frameworks to examine the performance implications of static knowledge resources and dynamic knowledge capabilities [108], [13-14], this study bridges important gaps in the literature by integrating insights from the previously isolated streams of IC, IT-based KM, and marketing research. Our findings enhance understanding of how knowledge-based resources and IT capabilities jointly contribute to customer value creation and market performance, and whether knowledge-based technologies alter the nature and strength of these effects. This integration is critical for advancing comprehension of how static and dynamic intangibles shape firm performance. Moreover, our findings also bring a novel nuance to the discussion on the interaction between IC and technology in customer value creation [13] by demonstrating that technological excellence is not always beneficial nor sufficient to address all performance challenges.

Second, our findings contribute to the current literature by confirming a shift in marketing toward customer value co-creation [100] and other stakeholders. Our results also enrich the marketing literature by advancing knowledge on the effects of IC on market performance, as prior studies have predominantly focused on overall performance, or, more specifically, on innovation performance [35]. We show, however, that IT is not uniformly tied to market success; instead, its role appears to be highly locational and con-

text-dependent. In our case, IT capabilities are only a marginal factor. This is an important finding, as most previous studies identifying a more prominent role for IT capabilities have investigated firms in advanced economies [36], [18] or have focused primarily on temporal context variations [32], [28].

Third, we test our framework in the transitional economy of Serbia. The results indicate that traditional frameworks may not work without adjustments in less-developed transitional economies compared to their advanced counterparts. For instance, in a United States context of cooperative networks, inter-organizational IT was a key component that drove knowledge-sharing [18]. This might not be the case in transitional economies, which might be guided by other factors derived from their past (e.g. personal networks). Hence, our study contributes to the literature by showing that the strategic value of dynamic IT capabilities is highly context dependent. It might well be that, in the context of a transitional economy, technology functions as a passive repository rather than an active enabler of intellectual capital integration into customer value and market performance.

Finally, this study contributes methodologically by applying a variance-based structural equation modelling approach (PLS-SEM) to explore the complex causal structures among multidimensional IC, technology-based KM, customer value, and market performance. The survey-PLS-SEM combination provides a rigorous yet flexible methodological framework for quantifying intangible, knowledge-based resources and capabilities, and their performance implications in emerging market contexts.

6.2 Managerial implications

Our study demonstrates that IC enables firms to improve customer value creation and thereby also performance in the market. Hence managers should pay attention to supporting and maintaining the knowledge-based resources of the firm. A particular focus should be on building and leveraging the intra- and inter-firm networks as well as the collective knowledge of the firm, as these will help to create added value for the customers.

Given the negative or non-significant moderation role of IT-enabled KM in the IC-performance relationship found in this study, managers should not take technology for granted, as it does not always drive customer value and market performance. It seems that, in certain economic contexts, a heavy reliance on IT-based KM capabilities may even backfire with respect to a firm's competitive positioning, even-

tually deteriorating its performance. Accordingly, while previous studies warn managers they might be at risk of underinvesting in IT [18], instead, we posit here there might be a risk in neglecting investments in more traditional relationships based on human networks that also create value for customers. Taking the findings of other studies [19] into consideration, it appears that managers are well-advised to aim for being on par with IT capabilities of their competitors, but IT leadership might not provide extra value added from a customer perspective.

For practitioners in Serbia, where many companies still operate in transitional and resource-constrained environments, our findings carry several important implications. First, Serbian firms, especially in traditional industries like manufacturing, should place greater emphasis on the tacit knowledge of experienced employees and encourage informal knowledge sharing [112]. Managers can support this by introducing cross-generational knowledge transfer initiatives, mentorship programs, and internal platforms that help capture and share valuable know-how before older employees retire.

In addition, to build structural capital, Serbian companies should adopt low-cost KM systems to codify best sales practices and customer preferences. A service-based company in Serbia, for instance, might use a shared database to store lessons learned from customers, which can improve customer responsiveness and service customization [113].

Moreover, while digital transformation is important, Serbian companies should be cautious not to over-invest in technology at the expense of human interaction. In practice, this means integrating IT solutions in ways that support rather than replace human input [114]. For example, a retail company could combine basic analytics tools with personal customer service training, ensuring that digital data enhances – not replaces – the personalized experience Serbian customers often expect [115].

Furthermore, managers should recognize that successful knowledge-based value creation in transitional contexts depends not only on technology adoption but also on nurturing a trust-based and collaborative organizational culture. Strengthening partnerships with universities and industry associations can further enhance relational capital and ensure that knowledge flows beyond firm boundaries, fostering greater adaptability and customer value in a rapidly evolving market environment.

Lastly, managers can assess their organization's readiness for digital transformation by systematically evaluating employee digital skills and training needs,

the extent to which the organizational culture supports change and experimentation, and the strength of external partnerships that provide access to complementary digital capabilities [39].

6.3 Limitations and future studies

First, the findings of this study are based on data from Serbian companies and, therefore, may have limited generalizability beyond this specific national and economic context. The contextual, cultural, organizational, and technological barriers identified in this study, such as underdeveloped knowledge-sharing cultures, fragmented KM practices insufficiently integrated with strategy, and early-stage digitalization with limited digital competences—are likely characteristic of transitional economies. These conditions may not accurately reflect the realities of more mature digital economies, where firms typically operate within advanced digital ecosystems supported by robust institutional frameworks, well-established knowledge infrastructures, and strong customer-centric orientations [18]. Future studies could test the research model also in other socio-economic environments. Second, some researchers argue that the impact of IC on performance issues is not immediate, but long-term. As our dataset was cross-sectional, it was unable to capture a longitudinal development. Exploring the temporal development of IC and IT capabilities and its implications for value creation would be an interesting topic for future research. Third, the sample included Serbian companies with more than 100 employees from a variety of sectors. This allowed us to derive more general management implications; however, it cannot be ruled out that, for instance, smaller firms may show different patterns. While the findings may have important implications for small and medium-sized enterprises (SMEs), any generalization should be approached with caution. SMEs often face resource constraints in both human capital development and IT infrastructure, yet they tend to rely heavily on close customer relationships and flexible organizational structures [116]. As such, SMEs may benefit from investments in relational and structural capital, such as customer knowledge systems, standardized processes, and informal networks [117]. At the same time, our findings warn that relying too heavily on IT—without simultaneously building internal capabilities and fostering a supportive culture—can lead to poor or even counterproductive outcomes in value creation. Regardless of company size, it appears that technology must be integrated thoughtfully and strategically, rather than treated as

a standalone solution [118], especially when intellectual capital is leveraged to generate customer value and competitiveness [111]. Fourth, we used convenience sampling which may introduce potential selection bias and limit generalizability, although we have taken measures to mitigate this risk by ensuring diversity in the sample. By using probability-based sampling methods future studies may enhance representativeness and robustness of findings. Fifth, the sample size was with 101 responses appropriate given the PLS-SEM requirements and in line with other studies in the field as discussed above. However, future studies could attempt to collect a larger sample to conduct further statistical analyses. Sixth, existing knowledge-oriented management tools often overlook the dynamic dimension of knowledge [119]. A cross-sectional or snapshot approach to IC and KM research can therefore provide only a limited and retrospective understanding of the processes underlying knowledge-based value creation [120]. To better capture these dynamics, future research should integrate system dynamics and causal loop models into the design of knowledge-oriented management systems, thereby emphasizing the evolving and interdependent nature of knowledge flows. This requires overcoming the persistent mismatch between theory and methods when addressing knowledge dynamics and complexity [121], [111]. Moreover, adopting configurational rather than purely symmetric approaches may offer additional insights into knowledge-based outcomes [27], [111]. In particular, asymmetrical techniques such as fuzzy-set qualitative comparative analysis (fsQCA) can account for equifinality and causal asymmetry [122], thereby enhancing the explanatory power of IC and KM research and practice in complex and dynamic ecosystems [111]. Seventh, the observation that IT may diminish the relevance of IC to customer value, presents an intriguing avenue for further research examining the dark side of technology for the value relevance of knowledge assets [123]. Eighth, the study relies exclusively on self-reported, perceptual measures of IC, IT capabilities, and customer value. Although perceptual indicators are widely used in KM and IC research [27], they may introduce subjective evaluation inaccuracies. While procedural and statistical remedies can reduce these risks, they cannot eliminate them entirely. Future studies could triangulate survey data with objective performance indicators, digital trace data (e.g., system logs), or externally verified measures to strengthen construct validity. Furthermore, future research is encouraged to explore industry sector-specific contingencies. Lastly, the use of con-

venience sampling may limit the external validity of the findings, as the sample may not be fully representative of the broader population.

Overall, this study underscores the broader significance of intellectual capital as a central driver of customer value creation and market performance, while challenging the widely held assumption that greater reliance on IT-enabled knowledge management automatically enhances these effects. By demonstrating that the value of IT capabilities is highly context-dependent, particularly in transitional economies, this research advances a more nuanced understanding of how static and dynamic knowledge resources interact in shaping firm outcomes. The findings highlight that technology should be viewed as a complementary, rather than dominant, enabler of knowledge-based value creation and that human, relational, and structural dimensions remain critical. In doing so, the study contributes to theory, informs managerial practice, and provides a foundation for future research to further unpack the complex, context-sensitive interplay between intellectual capital, technology, and performance in diverse economic environments.

Data availability statement

The dataset analyzed in the study is available from the corresponding author on reasonable request.

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Appendix A - Table 2. Measurement Model

	Convergent validity	Composite reliability	Cronbach Alpha	Dijkstra's reliability	AVE
Customer value creation (CUSTVAL)					
<i>Compared to other companies in its sector, how has your company succeeded in creating customer value over the past year? (1 = very poorly, 5 = very well)</i>					
Solving actual customer needs	0.793	0.943	0.930	0.932	0.704
Producing benefits related to perceptions and emotions of customers in addition to solving actual customer needs	0.845				
Customer trust in your company's products, services, and operations in general	0.822				
Responsiveness to enquiries and problems experienced by customers	0.833				
Employees' professionalism and business-like conduct as experienced by customers	0.861				
Care and individual attention as experienced by customers	0.854				
Value related to the display, tidiness, and functionality of the company's products and services as experienced by customers	0.864				
Market performance (MARKPER)					
<i>Compared to other companies in its sector, how do you think your company has succeeded in the following areas over the past year? (1 = very poorly, 5 = very well)</i>					
Net sales growth	0.895	0.888	0.811	0.830	0.727
Profitability	0.855				
Market share	0.805				
IT practices (ITP)					
<i>To what extent do the following statements on IT management practices apply to your company? (1 = completely disagree, 5 = completely agree)</i>					
Our company uses information technology to enable efficient information search and discovery	0.859	0.936	0.918	0.919	0.711
Our company uses information technology in its internal communication throughout the organization.	0.796				
Our company uses information technology to communicate with external stakeholders.	0.855				
Our company uses information technology to analyze knowledge to make better decisions.	0.837				
Our company uses information technology to collect business knowledge related to its competitors, customers, and operating environment, for example.	0.851				
Our company uses information technology to develop new products and services with external stakeholders.	0.858				
Structural capital (STRUCAP)					
<i>To what extent do the following statements on internal structures apply to your company? (1 = completely disagree, 5 = completely agree)</i>					
Our company has efficient and relevant information systems to support its business operations.	0.789	0.904	0.858	0.861	0.702
Our company has tools and facilities to support cooperation between its employees.	0.842				
Our company has a great deal of useful knowledge stored in documents and databases.	0.873				
Existing documents and solutions are easily accessible.	0.844				

	Convergent validity	Composite reliability	Cronbach Alpha	Dijkstra's reliability	AVE
Human capital (HUMCAP)					
<i>To what extent do the following statements on employee competence apply to your company? (1 = completely disagree, 5 = completely agree)</i>					
Our employees are highly skilled at their jobs.	0.872	0.904	0.841	0.857	0.759
Our employees are highly motivated in their work.	0.886				
Our employees have a high level of expertise.	0.855				
Relational Capital (RELCAP)					
<i>To what extent do the following statements on internal cooperation apply to your company? (1 = completely disagree, 5 = completely agree)</i>					
Different units and functions within our company—such as R&D, marketing, and production—understand each other well.	0.774	0.917	0.891	0.898	0.648
Our employees frequently collaborate to solve problems.	0.831				
Internal cooperation in our company is smooth.	0.768				
<i>To what extent do the following statements on external cooperation apply to your company? (1 = completely disagree, 5 = completely agree)</i>					
Our company and its external stakeholders—such as customers, suppliers, and partners— understand each other well.	0.804				
Our company and its external stakeholders frequently collaborate to solve problems.	0.796				
Cooperation between our company and its external stakeholders is smooth.	0.852				

Appendix B - Table 5. Model fit and quality indices

	Scores	Range
Average path coefficient (APC)	0.251, P=0.002	
Average R-squared (ARS)	0.603, P<0.001	
Average adjusted R-squared (AARS)	0.588, P<0.001	
Tenenhaus GoF (GoF)	0.697	small ≥ 0.1 , medium ≥ 0.25 , large ≥ 0.36
Sympson's paradox ratio (SPR)	0.857	acceptable if ≥ 0.7 , ideally = 1
R-squared contribution ratio (RSCR)	0.989	acceptable if ≥ 0.9 , ideally = 1
Statistical suppression ratio (SSR)	1.000	acceptable if ≥ 0.7