






“The role of CEO attributes in firms’ intellectual capital efficiency: Evidence from service and manufacturing firms listed on the Amman stock exchange”

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THE ROLE OF CEO ATTRIBUTES IN FIRMS' INTELLECTUAL CAPITAL EFFICIENCY: EVIDENCE FROM SERVICE AND MANUFACTURING FIRMS LISTED ON THE AMMAN STOCK EXCHANGE

Abstract

The objective of this study is to examine the relationship between firms' top management's demographic attributes and intellectual capital efficiency among service and manufacturing firms listed on the Amman Stock Exchange. The analysis focuses on six personal and professional characteristics of the chief executive officer, including age, educational level, work experience, share ownership, duality, and tenure. Intellectual capital efficiency is determined using the value-added intellectual coefficient. Panel data for a sample of 90 service and manufacturing companies for the period 2015–2023 are analyzed using multiple regression techniques. The findings reveal that the educational level and share ownership have a statistically significant positive effect on intellectual capital efficiency ($p < 0.05$). This suggests that executives with higher qualifications and financial stakes in their firms are more effective at leveraging intellectual capital. In contrast, there is no statistically significant association between age, work experience, role duality, and tenure and the efficiency of intellectual capital. This suggests that these demographic and structural characteristics of firm leadership do not meaningfully influence how effectively intellectual capital is utilized.

Keywords

performance, human capital, qualifications, ownership, duality, tenure, Jordan

JEL Classification

L25, M41, O34

INTRODUCTION

In today's knowledge-driven economies, intangible assets have become increasingly vital to firm success, with intellectual capital playing a central role in value creation and competitive advantage (Edvinsson & Malone, 1997; Stewart, 1998). Intellectual capital encompasses intangible assets of knowledge, innovation, and relationships, which together significantly contribute to a firm's capacity to innovate, adapt, and maintain long-term performance (Pulic, 2000; Chen et al., 2004). As a result, intellectual capital efficiency – a measure of how effectively firms utilize their intangible assets – has gained attention as a critical determinant of firm performance, especially in knowledge-intensive sectors.

Simultaneously, the strategic role of chief executive officers (CEOs) in influencing organizational outcomes has been well documented. CEOs are not only responsible for daily operations but also for setting the strategic direction of their firms, which includes managing and leveraging intellectual capital resources effectively (Hambrick & Mason, 1984; Custódio & Metzger, 2014). CEO characteristics



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such as education, experience, ownership, and tenure have been shown to influence firm decision-making and resource allocation, including the management of intellectual capital (Barker & Mueller, 2002; Wang et al., 2016).

However, the existing literature provides inconsistent evidence on how specific CEO attributes affect intellectual capital efficiency. For instance, some studies suggest that higher education levels and relevant industry experience are positively linked to intellectual capital efficiency (Kamath, 2008; Joshi et al., 2013), while findings on age, tenure, and CEO duality remain inconclusive or context-dependent (Phusavat et al., 2011). Moreover, most empirical research on this topic has focused on developed economies, with relatively little systematic investigation in developing markets, such as Jordan, where corporate governance structures and managerial dynamics differ significantly.

Thus, there is a pressing need for more empirical studies that examine the relationship between CEO demographic characteristics, such as age, education, experience, share ownership, duality, and tenure, and intellectual capital efficiency, particularly in emerging market contexts.

1. LITERATURE REVIEW

There are several theoretical perspectives related to the study of the relationship between CEOs' attributes and intellectual capital efficiency. First, as outlined by Barney (1991), the resource-based view of a firm suggests that firms with unique and valuable resources that other companies cannot imitate can achieve sustained competitive advantage. Intellectual capital represents a resource, with its various components contributing to an organization's innovation, productivity, and overall success. Human capital represents employees' skills, capabilities, and knowledge. Structural capital consists of organizational processes, databases, and patents that are crucial for supporting innovation and overall firm performance. Relational capital, which includes customer relationships, brand reputation, and strategic alliances, is essential to a company's ability to create value in the marketplace. Unlike physical capital, these intangible resources are not reflected in traditional financial statements, but play a significant role in firms' long-term growth and profitability. Lev (2001) and Stewart (1998) asserted that intellectual capital is a key factor in maintaining a sustainable competitive advantage for the firm. In addition, Bontis et al. (2000), Edvinsson and Malone (1997), and Odat and Bsoul (2022) show that the effective management of intellectual capital enhances firms' profitability, market valuation, and innovation.

Second, CEOs, as key decision-makers within firms, are central to intellectual capital management and exploitation. In this regard, demographic attributes

such as age, qualifications, experience, and tenure can influence how effectively intellectual capital is utilized to enhance organizational performance. Their experiences, values, and cognitive bases, as suggested by the upper echelons theory, influence their decisions and actions and, as a result, influence organizational performance (Hambrick & Mason, 1984). This theoretical framework suggests that CEOs' demographic attributes play a key role in the efficiency of intellectual capital management within firms. Third, based on Becker's (1964) human capital theory, employees' qualifications, experience, and skills influence their productivity and, therefore, benefit the firm overall (Terjesen et al., 2009).

The age of the CEO has been widely examined in relation to firm performance and leadership style. Some scholars argue that older CEOs often possess adequate experience and wisdom that enables them to better understand the firm's operations and market conditions, resulting in more efficient decisions. Such CEOs are better able to manage intellectual capital effectively because of their greater experience in recognizing the value of intangible assets, particularly human and relational capital (Harris & Helfat, 1997). In contrast, others argue that younger CEOs are generally viewed as more dynamic, innovative, and risk-taking, which encourages the exploration of new ideas and approaches to intellectual capital management. For example, examining the association between CEO age and intellectual capital efficiency in China, Battisti et al. (2022) find that younger CEOs manage intellectual capital more efficiently than older CEOs. In addition, Barker and

Mueller (2002) indicate that younger CEOs may be better suited for optimizing intellectual capital in knowledge-intensive industries.

CEOs' educational background, specifically their level of education and specialization, has been shown to significantly influence intellectual capital management. CEOs' qualifications increase the pool of knowledge and promote innovation outcomes (Pitcher & Smith, 2001). CEOs with advanced degrees, particularly in business, engineering, and technology, often possess strong analytical and strategic thinking skills that are essential for enhancing intellectual capital. Therefore, highly qualified CEOs tend to invest more in developing human, structural, and relational capital. For example, Kallunki et al. (2011) found that CEOs with backgrounds in business or technology are more likely to invest in human and structural capital. King et al. (2016) show that CEOs with advanced degrees in the management or technical fields positively influence firm performance through more efficient decisions. Moreover, Pitcher and Smith (2001) suggest that CEOs' qualifications, particularly their expertise in managing organizational knowledge, foster innovation and more effective utilization of intellectual capital.

CEO experience, especially in knowledge-based industries, can play a significant role in their ability to manage intellectual capital. CEOs with experience in relevant sectors can better understand the importance of human, structural, and relational capital in the long-term success of a company (Chen et al., 2004). Such experience allows them to utilize employees' skills and knowledge more effectively and implement organizational processes and structures that facilitate innovation and protect intellectual property. For example, Bontis et al. (2000) and Edvinsson and Malone (1997) show that CEOs with industry experience tend to excel in managing intellectual capital and promoting organizational learning, resulting in superior firm performance.

CEOs' ownership stakes in their companies' shares are another factor that can influence intellectual capital efficiency. It has the potential to align the interests of the CEO with shareholders' interests, and therefore, motivates them to enhance firm performance through effective management of intellectual capital. However, large ownership stakes can lead to entrenchment, whereby CEOs may use their con-

rol over the company to pursue personal interests at the expense of long-term value creation (Shuto & Takada, 2010). This may result in underinvestment in intellectual capital or failure to fully utilize intellectual assets for innovation and growth. Studies examining the relationship between ownership and intellectual capital efficiency present mixed findings, with some indicating a positive relationship, while others highlight potential negative effects stemming from entrenchment and risk aversion.

CEO duality, the case in which the CEO also occupies the position of board chairperson, has been a subject of considerable debate in the accounting literature. Proponents of CEO duality argue that a dual leadership structure allows for better decision-making and a more coherent strategic direction, which could positively influence the efficient management of intellectual capital (Jensen, 1993). Opponents, however, suggest that duality can create conflicts of interest and reduce accountability, potentially undermining the effective utilization of intellectual capital. In terms of intellectual capital management, CEO duality may shift the focus toward short-term outcomes rather than long-term investments in human, structural, and relational capital (Battisti et al., 2022). Empirical studies on the effects of duality on intellectual capital efficiency show mixed results, suggesting that its impact may depend on the specific context of the firm and its governance structure.

CEO tenure, which represents the length of time CEOs have held their positions, is another important factor that can influence intellectual capital efficiency. CEOs with long tenures are often associated with deeper knowledge of the firm's culture, operations, and market, which can enhance their ability to manage intellectual capital effectively. They may be better positioned to cultivate trust and loyalty within the organization, thereby strengthening human and relational capital. However, there are potential drawbacks to long CEO tenures, including the risk of complacency, resistance to change, and entrenchment of outdated strategies. Harris and Helfat (1997) suggest that while longer tenures may provide CEOs with valuable institutional knowledge, they may also limit companies' ability to innovate and adapt, as fresh perspectives may be lacking. Therefore, the impact of tenure on intellectual capital efficiency may depend on balancing experience with adaptability.

In summary, the review of the literature on intellectual capital demonstrates the essential role that CEO attributes can play in enhancing intellectual capital efficiency. However, their impact varies across contexts and related factors, underscoring the need for further research that explores this impact in greater depth, particularly in developing countries. From this perspective, this study aims to analyze the impact of CEO demographic characteristics – specifically, age, educational level, work experience, share ownership, duality, and tenure – on intellectual capital efficiency in the Jordanian context.

Based on the above discussion, the following hypotheses have been developed. They are stated in terms of the null hypothesis because mixed results are observed in previous literature:

H_1 : *There is no significant association between CEO age and intellectual capital efficiency.*

H_2 : *There is no significant association between CEO qualifications and intellectual capital efficiency.*

H_3 : *There is no significant association between CEO experience and intellectual capital efficiency.*

H_4 : *There is no significant association between CEO ownership and intellectual capital efficiency.*

H_5 : *There is no significant association between CEO duality and intellectual capital efficiency.*

H_6 : *There is no significant association between CEO tenure and intellectual capital efficiency.*

2. METHOD

The initial sample consists of all non-financial companies listed on the Amman Stock Exchange during 2015–2023. However, companies that did not have all of the required data for the variables of interest were excluded. Additionally, because financial companies are subject to specific laws that may affect the results, they were excluded from our analysis. We ended up with 90 companies, with 810 firm-year observations. The required data for the variables included

were collected from the firms' annual reports, the Amman Stock Exchange website, and the Jordanian Securities Depository Center website.

Intellectual capital efficiency is the dependent variable in the analysis. This study uses Pulic's (1998) value-added intellectual capital coefficient (VAIC) to quantify this variable. The VAIC is calculated by summing three elements: capital employed efficiency (CEE), human capital efficiency (HCE), and structural capital efficiency (SCE).

$$CEE = \frac{VA}{CE}, \quad (1)$$

where VA refers to the value created for all stakeholders of the firm during the year.

It is computed using the following equation:

$$VA = EBIT + W + D + A, \quad (2)$$

where $EBIT$ is the firm's earnings before interest and tax; W is wages and salaries incurred during the year; and D and A are depreciation and amortization expenses, respectively. CE capital employed is the book value of the company's physical assets. CEE represents the value added to stakeholders by each unit of the currency of physical capital.

$$HCE = \frac{VA}{HC}, \quad (3)$$

where HC represents knowledge, experience, and skills possessed by employees. It is defined as all expenses paid to employees during the year, including training, salaries, and wages. HCE represents the value created by each unit of currency paid to the employees.

Finally,

$$SCE = \frac{SC}{VA}, \quad (4)$$

where SC is structural capital and represents firms' databases, information systems, and other organizational infrastructure. It was measured as

$$SC = VA - HC. \quad (5)$$

where SCE represents the value created for stakeholders by each unit of currency paid on structural capital.

The independent variables were six CEOs' traits: age, qualifications, experience, ownership, duality, and tenure. Age is the difference between the observation year and the CEO's year of birth. The variable qualification is 3 if a CEO holds a Ph.D. degree, 2 if he holds a Master's degree, 1 if he holds a Bachelor's degree, and 0 otherwise. Experience is the number of years that the CEO has served as a CEO during their life, even in different companies. Ownership is the percentage of the company's shares owned by its CEO to total assets. Duality is a dummy variable equal to 1 if duality exists (i.e., one individual occupies both positions as a CEO and board chairperson) and 0 otherwise. Finally, tenure is the number of years the CEO has held his position within the company (Martino et al., 2020).

The study controls for several variables that have been documented to influence intellectual capital efficiency. These variables include firm size (Kweh et al., 2022; Kurniawan & Muharam, 2021; Sugandi et al., 2021), profitability (Nadeem et al., 2018), and leverage (D'Amato, 2021). Firm size is measured using the natural logarithm of total assets, while profitability is measured by the return on assets ratio (ROA), and leverage is determined as total debt divided by total equity. The firm sector is included to examine whether firms from different sectors exhibit different intellectual capital efficiency.

To investigate the impact of CEO attributes on intellectual capital efficiency, the following regression model was developed:

$$\begin{aligned}
 VAIC_{i,t} = & \alpha + \beta_1 \cdot AGE_{i,t} + \beta_2 \cdot QUAL_{i,t} \\
 & + \beta_3 \cdot EXP_{i,t} + \beta_4 \cdot OWN_{i,t} + \beta_5 \cdot DUAL_{i,t} \quad (6) \\
 & + \beta_6 \cdot TENR_{i,t} + \beta_7 \cdot SIZE_{i,t} + \beta_8 \cdot ROA_{i,t} \\
 & + \beta_9 \cdot LEV_{i,t} + \beta_{10} \cdot IND_i + e,
 \end{aligned}$$

where $VAIC_{i,t}$ – Value-added intellectual capital coefficient for firm i in year t . $AGE_{i,t}$ – Firm i CEO age in year t . $QUAL_{i,t}$ – Qualifications of firm i CEO in year t . $EXP_{i,t}$ – Experience of firm i CEO in year t . $OWN_{i,t}$ – firm i CEO's share ownership in year t . $DUAL_{i,t}$ – CEO duality for firm i in year t . $TENR_{i,t}$ – CEO tenure for firm i in year t . $SIZE_{i,t}$ – Firm i size in year t . $ROA_{i,t}$ – Return on assets ratio for firm i in year t . $LEV_{i,t}$ – Leverage ratio for firm i in year t . IND_i – Firm i sector. e – Error term.

3. RESULTS

Descriptive statistics for all the variables examined are shown in Table 1. Regarding the dependent variable, value-added intellectual capital, the sample firms' average during the study period was 2.885, with a standard deviation of 10.054. For the individual firms in the sample, the minimum and maximum values were -140.119% and 54.813%, respectively. These figures indicate a large variation among the sampled firms in utilizing intellectual capital to create value for their stakeholders.

Table 1. Descriptive statistics

Variable	Mean	S. Dev	Min	Max
VAIC	2.885	10.054	-140.119	54.813
AGE	55.790	11.301	22.000	87.000
QUAL	1.360	0.714	0000	3.000
EXP	9.960	10.923	1.000	56.000
OWN	0.020	0.081	0000	0.0955
DUAL	0.080	0.279	0000	1.000
TENR	7.760	9.630	1.000	56.000
SIZE	7.386	0.906	0000	9.158
ROA	0.013	0.178	-1.981	1.361
LEV	0.620	4.705	0.001	99.668
IND	0.570	0.496	0000	1.000

As Table 1 shows, the average age of CEOs is 55.79 years, ranging from 22 to 87 years. This is consistent with Bsoul et al. (2022) and Qawasmeh and Azzam (2020), who found that the average age of CEO in the Jordanian context is approximately 52.42 years. In addition, CEOs hold postgraduate degrees on average. The mean and standard deviation for this variable are 1.36 and 0.714, respectively. As for experience, on average, the CEOs of the sample firms have nearly 10 years of experience. The CEOs' experience ranged between 1 and 56 years. This result is consistent with those reported by Bsoul et al. (2022). Regarding share ownership, CEOs' shareholding in their companies varies from 0 to 9.55% of the company's issued shares, with a mean of 2% and a standard deviation of 8.1%. Furthermore, the data analysis reveals that on average, 8% of CEOs hold dual positions. This finding slightly contrasts with that of Bsoul et al. (2022), who report that nearly 13.5% of CEOs in Jordanian manufacturing and service firms exhibit duality. Finally, the average CEO tenure is approximately eight years, with the shortest and longest tenures spanning from one to 56 years. This result aligns with Bsoul et al. (2022) in the

Jordanian context, as well as those of Martino et al. (2020) in the Italian context.

Regarding the control variables, the average firm size, measured in terms of the logarithm of total assets, was approximately 7.38 with a standard deviation of 0.906. Also, the sample firms are earning a return of 1.34% of their total assets, with a standard deviation of 17.8%. In addition, the sample firms are 61.9% financed through debt. Finally, 57% of the sample firms are from the manufacturing sector.

Table 2 presents the coefficients of Pearson's correlation between the study variables. Except for the correlation between experience and tenure, no coefficient between the independent variables was higher than 0.70. However, the variance inflation factors (VIFs), which appear in Table 3, confirm that there is no multicollinearity problem that may affect the analysis because all VIF values are less than 10 (Gujarati, 2003).

Table 2 shows that experience is highly and positively correlated with tenure (0.899), suggesting that longer experience aligns with longer tenure in the organization. Experience and tenure are also positively correlated with CEO age, reflecting the experience and stability of management over time. Duality and ownership are also positively correlated, suggesting that dual position CEOs tend to own a larger ownership interest in their companies. Regarding the control variables, firm size is positively correlated with ROA (0.310), indicating that larger companies are somewhat more likely to be more profitable. Finally, ROA and leverage are negatively correlated (-0.354), suggesting that companies with higher leverage have lower profitability.

To test the hypotheses and determine the effect of CEO traits on firms' intellectual capital efficiency, the data were analyzed using a multiple regression technique. Table 3 presents a summary of the results. The *F*-statistic, which is statistically significant, confirms the validity of the regression model used. The R^2 value of 0.451 indicates that approximately 45% of the variation in firms' intellectual capital efficiency can be explained by the variables examined.

Table 3 shows the statistically insignificant positive coefficient for *AGE* ($t = 0.575$, $p = 0.565$). This indicates that CEO age does not significantly affect intellectual capital efficiency. As a result, Hypothesis 1 is accepted. Second, the coefficient of *QUAL* is negative and statistically significant ($t = 2.501$, $p = 0.013$). This result leads to rejecting Hypothesis 2 and accepting the alternative hypothesis that there is a significant association between CEOs' qualifications and intellectual capital efficiency. The negative coefficient for CEO qualifications suggests that higher CEO qualifications are associated with a decrease in intellectual capital efficiency. Third, the coefficient of *EXP* is positive and statistically insignificant ($t = 0.207$, $p = 0.836$); therefore, Hypothesis 3 is accepted. This lack of significance suggests that CEO experience may not be a determining factor in a firm's ability to manage or leverage intellectual capital. Fourth, the coefficient of *OWN* is negative and statistically significant ($t = 2.503$, $p = 0.012$); therefore, Hypothesis 4 is rejected, and the alternative hypothesis that there is a significant association between CEOs' qualifications and intellectual capital efficiency is accepted. The negative coefficient for CEO ownership suggests that CEOs with higher ownership stakes tend to have a lower in-

Table 2. Pearson correlation coefficients

Variables	VAIC	AGE	QUAL	EXP	OWN	DUAL	TENR	SIZE	ROA	LEV	IND
VAIC	1	-	-	-	-	-	-	-	-	-	-
AGE	.140	1	-	-	-	-	-	-	-	-	-
QUAL	-.029	.007	1	-	-	-	-	-	-	-	-
EXP	.061	.376	.047	1	-	-	-	-	-	-	-
OWN	-.122	.042	-.223	-.117	1	-	-	-	-	-	-
DUAL	.025	.082	-.122	.000	.135	1	-	-	-	-	-
TENR	.087	.379	.044	.899	-.094	.039	1	-	-	-	-
SIZE	.427	.155	.129	.060	-.217	-.053	.119	1	-	-	-
ROA	.601	.140	.024	.019	.011	.080	.057	.310	1	-	-
LEV	-.188	-.009	.081	.029	-.175	-.011	.070	.258	-.354	1	-
IND	-.170	-.019	.063	.044	-.102	.138	.087	.119	.057	.070	1

Table 3. Regression results

Variables	Coefficient	t-stat	p-value	Tolerance	VIF
AGE	0.023	0.575	0.565	0.810	1.235
QUAL	-0.423	-2.501**	0.013	0.927	1.079
EXP	0.005	0.207	0.836	0.180	5.561
OWN	-3.957	-2.530**	0.012	0.802	1.247
DUAL	0.094	0.217	0.828	0.926	1.080
TENR	0.005	0.166	0.868	0.176	5.671
SIZE	1.421	6.606*	0.000	0.668	1.469
ROA	15.306	10.932*	0.000	0.669	1.494
LEV	-1.550	-2.544**	0.011	0.509	1.964
IND	-0.149	-0.549	0.583	0.742	1.348
F: 32.772				R ² = 0.451	
Sig. = 000				Adjusted R ² = 0.438	

Note: * the result is significant at the 1% level; ** the result is significant at the 5% level.

tellectual capital efficiency. Fifth, the coefficient of *DUAL* is positive and statistically insignificant ($t = 0.217$, $p = 0.828$); therefore, Hypothesis 5 is accepted. CEO duality does not significantly affect intellectual capital efficiency. Finally, the coefficient of *TENR* is positive but statistically insignificant ($t = 0.166$, $p = 0.868$); therefore, Hypothesis 6 is accepted. This suggests that the period during which a CEO has been with the firm is not a key factor in driving intellectual capital efficiency.

Regarding the control variables, the coefficients on both *ROA* and *SIZE* are significantly positive at 1% level, indicating that as the firms' return on assets and size increase, intellectual capital efficiency increases. On the other hand, the result of the *LEV* coefficient suggests a significant negative effect on firms' ICE, which means that an increase in leverage results in a reduction in intellectual capital efficiency. However, there is no significant association between the firm industry and intellectual capital efficiency, since the coefficient of *IND* is insignificant.

4. DISCUSSION

Only two of the six CEOs' attributes examined had a significant relationship with intellectual capital efficiency. CEO qualifications are negatively associated with intellectual capital efficiency, suggesting that higher CEO qualifications are associated with a decrease in intellectual capital efficiency. This is an interesting finding because it contradicts the argument that CEOs' qualifications enlarge the pool of knowledge and promote innovation outcomes (Pitcher & Smith, 2001) and

that CEOs with advanced degrees often possess strong analytical and strategic thinking skills that are essential for enhancing intellectual capital. Our results imply that CEOs with higher qualifications may not necessarily translate to better intellectual capital utilization. This could be due to overqualification, in which a highly qualified CEO might not align with the specific needs of the firm in managing its intellectual assets. A highly qualified CEO might focus more on complex theoretical strategies rather than practical, innovative ways to optimize intellectual capital (such as employee creativity, tacit knowledge, and collaboration). These CEOs may be less involved in the day-to-day processes that boost intellectual capital efficiency. Instead, they may focus on broader strategies or financial aspects, leaving less room for direct engagement with knowledge management, talent development, and innovation. This could also be due to over-reliance on traditional managerial skills rather than leveraging more innovative or creative intellectual resources. Highly qualified CEOs may be more cautious and risk-averse, preferring proven methods instead of encouraging risk-taking or experimentation, which could lead to more innovative use of intellectual capital. This could result in lower efficiency in exploiting intangible assets' potential. Our results regarding the relationship between CEO qualification and intellectual capital efficiency are inconsistent with Pitcher and Smith (2001), who suggest that the educational background of CEOs fosters innovation and more effective utilization of intellectual capital.

The other CEO attribute that has a significant relationship with intellectual capital efficiency is share

ownership, which is negatively related to intellectual capital efficiency. This suggests that CEOs with higher ownership stakes in the firm tend to have lower intellectual capital efficiency. This could indicate that CEOs with significant ownership may focus more on protecting their financial interests rather than optimizing intellectual capital. In firms with high ownership concentration, CEOs might prioritize short-term outcomes over long-term knowledge management and innovation, which are crucial for enhancing intellectual capital efficiency. Another possibility is that CEOs with substantial equity holdings may become more risk-averse because they have a lot to lose if stock prices decline. Therefore, higher ownership could lead to more conservative decision-making, which might limit the innovative use of intellectual capital. Consequently, they might avoid investments in intellectual capital (such as experimenting with new technologies, encouraging creativity, or hiring new talent) that involve uncertainty, even though these investments could potentially improve intellectual capital efficiency in the long run. Our results are consistent with Shuto and Takada (2010), who suggest that large ownership stakes can lead to entrenchment, where CEOs may use their control over the company to pursue personal interests at the expense of long-term value creation, resulting in underinvestment in intellectual capital or failure to fully leverage intellectual assets for innovation and growth.

Regarding the remaining CEO attributes, CEO age, experience, duality, and tenure, our results show no significant association between these attributes and intellectual capital management efficiency. This may suggest that intellectual capital efficiency is more influenced by other factors than CEOs' attributes, such as organizational culture, strategy, and innovation. Our results regarding age are inconsistent with those of Harris and Helfat (1997), who suggest that older CEOs are often better able to manage intellectual capital effectively. It is also inconsistent with Barker and Mueller (2002) and Battisti et al. (2022), who find that younger CEOs are more efficient in managing intellectual capital than older CEOs. The results regarding experience are inconsistent with Bontis et al. (2000) and Edvinsson and Malone (1997), who show that CEOs with extensive industry experience tend to excel in managing intellec-

tual capital and promoting organizational learning. The result regarding CEO duality is inconsistent with Jensen's (1993) argument that a unified leadership structure allows for better decision making and a more coherent strategic direction, which could positively influence the efficient management of intellectual capital. Finally, the result regarding tenure is inconsistent with Harris and Helfat (1997), who suggest that longer tenures may limit a firm's ability to innovate and adapt, as fresh perspectives may be lacking.

The findings show that firm size, profitability, and leverage are significantly associated with intellectual capital efficiency. Specifically, a significant positive association between firm size and intellectual capital efficiency is observed, which can be explained by the fact that knowledge diffusion and creation are influenced by an organization's size, which is "inherently evolutionary in nature" (Reed et al., 2006). Further, larger firms with diverse operations and business branches are typically managed by professional management teams that are more capable of investing in and managing intellectual capital resources. Youndt et al. (2004) suggest that this positive effect arises from advantageous access to resources and market power. Our results are consistent with those of Nassar et al. (2018), Hatane et al. (2017), and Shabitah and Shatnawi (2020) in the Jordanian context. However, they contradict the results of Putri et al. (2020) and Meressa (2016), who report that firm size is negatively related to intellectual capital efficiency.

Profitability and leverage exhibit opposing relationships with intellectual capital efficiency. Whereas profitability is positively related to intellectual capital efficiency, leverage shows a significantly negative relationship. These results indicate that more profitable firms and firms that use less debt tend to have higher intellectual capital efficiency. These results align with pecking order theory, which posits a negative relationship between leverage and profitability (Fama & French, 2002; Rajan & Zingales, 1995). This is also in line with Nadeem et al. (2018), who implied that companies with higher profitability are better positioned to invest in and manage their intellectual capital, thereby enhancing their overall performance. Profitable firms are likely to have effective man-

agement teams that are capable of making strategic decisions that enhance intellectual capital utilization. This includes investing in employee training, forming strategic partnerships, and adopting technologies that increase the value of intellectual capital. On the contrary, high leverage indicates that a firm has a substantial amount of debt, which can create financial pressure. This financial burden may lead to a more conservative approach for investment decisions, including those related to intellectual capital. Firms with high debt may be less willing to invest in human capital, R&D, or

other intellectual assets because they need to prioritize debt repayment, interest costs, and financial stability. Consequently, these firms may not effectively utilize or develop their intellectual capital, leading to lower intellectual capital efficiency. Our results are consistent with D'Amato (2021) but differ from those of Necib and Jarbou (2022), who report a positive and significant association between leverage and intellectual capital efficiency. Finally, the results suggest that the industry in which a firm operates does not significantly affect its ability to manage intellectual capital.

CONCLUSION

This study aims to explore the relationship between CEO personal and professional attributes and intellectual capital efficiency in companies listed on the Amman Stock Exchange during 2015–2023. The results indicate that CEO qualifications and share ownership are significantly related to intellectual capital efficiency, whereas CEO age, experience, duality, and tenure have no significant relationship with intellectual capital efficiency, indicating that other factors might play a more pivotal role in influencing intellectual capital efficiency. While higher qualifications are often presumed to enhance leadership and strategic decision-making, the results suggest that overqualification might lead to an emphasis on conventional managerial skills at the expense of fostering creativity, innovation, and knowledge management, which are central to the effective use of intellectual capital. In addition, higher ownership stakes may prioritize short-term financial security over long-term investments in intangible assets such as innovation and employee development. These results would add to the understanding of how CEOs' qualifications and ownership interests can sometimes hinder the aggressive pursuit of innovation and knowledge management strategies that would enhance intellectual capital efficiency. The results also reveal that company-specific attributes, such as profitability, size, and leverage, are more related to intellectual capital efficiency than CEO's personal traits, with larger, more profitable, and less leveraged firms showing higher intellectual capital efficiency.

This study underscores the need to carefully assess the alignment between a CEO's qualifications, ownership structure, and ability to effectively manage intellectual capital. Companies should be mindful that, while academic qualifications and ownership stakes can bring certain benefits, they may not always result in the optimal management of intellectual capital.

This study enriches the literature on the role of CEOs in firm performance and value creation by providing valuable insights into how top management's characteristics can influence intellectual capital efficiency. It has important practical implications, especially for those involved in executive selection and development processes. Ensuring that CEOs possess the right mix of skills, experience, and a strategic mindset focused on innovation and knowledge management could be crucial in maximizing intellectual capital efficiency and driving long-term firm success.

AUTHOR CONTRIBUTIONS

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