Social Capital, Human Capital, Tacit Knowledge, and Innovations: A Polish-US Cross-Country Study

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Abstract: This study measures the relationship between human and social capital (internal and external) and tacit knowledge sharing's influence on innovativeness among knowledge workers employed in Polish (n=1050) and US (n=1118) organizations. The structural equation modeling method revealed that internal social capital matters more for organizational innovativeness in the US. In Poland, both external and internal were important. Specifically, in the US, external social capital supports internal innovativeness directly and external - indirectly. On the contrary, in Poland, social capital directly influences internal and external innovativeness. These differences are partially due to country differences regarding public and private financing. Also apparent is the need for strong social bonds between employees in innovative companies. Furthermore, this study confirms that internal innovativeness is vital for external innovativeness and reveals that social capital is a structural enabler for innovativeness, given its critical role in the distribution of tacit knowledge.

Keywords: Tacit knowledge, social capital, process innovation, product & service innovation, IT industry, Poland, US

1. Introduction

Human capital encompasses individuals' knowledge and abilities, whereas social capital connotes social bonds. Since organizations exist to achieve communal aims, not individual ones, human capital and social capital are consistently positively correlated with organizational performance (Dimov & Sheperd, 2005; Felício et al., 2014). Both are vital for organizational development and, similarly, organizational innovativeness and are of scientific interest. Recently, human capital's influence on social capital has been shown by Felício et al. (2014) and Dahiyat et al. (2021), revealing that human capital fosters social capital, both foster knowledge transfer, and thus has a positive, significant effect on organizational capital. This study extends these findings, exploring how both influence organizational innovativeness (external and internal) through tacit knowledge sharing.

Tacit knowledge has been a core KM idea since its beginning. Evolving from sociology (Polanyi, 1961), the explicit/tacit differentiation was fundamental to understanding organizational knowledge assets. Nonaka (1994) and Nonaka & Takeuchi (1995) focused on the distinction, contrasting codifiable, explainable explicit knowledge with hard-to-express, hard-to-share tacit knowledge. To leverage these knowledge assets, this distinction is important. Explicit knowledge can be codified and so more amenable to organizational capture and sharing through formal processes and procedures as well as information technology systems (Matson et al., 2003; Thomas et al., 2001). Alternatively, tacit knowledge is more personal knowledge, strongly contextual, and uncodified. The tacit knowledge owner may not even be aware, especially when first acquired (Asher & Popper, 2019; Olaisen & Revang, 2018). So, tacit knowledge is harder to identify and perhaps impossible to formalize, but since it often represents more discontinuous insights and ideas, it is the main source of organizational innovations (Kucharska, 2017; Kucharska et al., 2017). Therefore, it is extremely precious as a potential source of competitive advantage. Specifically, Liu & Han (2012) associated tacit knowledge with creativity in innovation processes. Sheng (2019) was able to show that tacit knowledge does conditionally contribute to product innovativeness. Finally, Ganguly et al. (2019) demonstrated tacit knowledge characteristics are connected to organizational innovation capabilities. Indeed, Kucharska (2021 a-c) empirically identified tacit organizational mechanisms influencing internal and external innovativeness.

This paper expands Kucharska's (2021a-c) and Dahiyat et al.'s (2021) studies, linking human and social capital to innovative performance due to tacit knowledge sharing in a cross-country approach.

2. Conceptual Framework

According to human capital theory, knowledge is a source of personal development, contributing to fuller organizational and societal development (Becker, 1964; Mincer, 1974). Alternatively, social capital theory refers to individuals' ability to extract benefits from their social network's structure, intensity, and quality (Lin et al.,

1981; Portes, 1998). Social capital encompasses the context and number of relationships and their qualities such as interpersonal trust and organizational norms shaping the cooperative behaviors and relationships, including knowledge sharing, contributing to organizational development (Anklam, 2002; Felício et al., 2014; Dahiyat et al., 2021). Social capital facilitates the discovery of opportunities inside and outside the organization, fostering the configuration of organizational resources required by these opportunities (Felício et al., 2014; Uzzi, 1999). Therefore, social capital found in formal and informal organizational social networks is a kind of infrastructure for human capital dissemination and its transformation into internal and external innovations.

Organizational human capital is related to employees' knowledge, capabilities, experience, education level, soft and professional skills, and other personal characteristics (Bellucci et al., 2021; Hussinki et al., 2017), allowing a broader range of internal and external development opportunities (Davidsson and Honig, 2003). But these opportunities are highly dependent on cooperation. Since a company is a collective achieving more than individuals alone, it is reliant on a higher level of social capital and high-quality organizational bonds beyond simple relations. Individuals with higher human capital possess the potential to form these bonds based on their perceived usefulness. Hence, the following hypotheses:

H1a: Human capital positively influences internal social capital
H1b: Human capital positively influences external social capital

Moreover, Dahiyat et al. (2020) empirically demonstrated that human capital has a positive and significant effect on knowledge transfer. Following them, in a tacit knowledge context: We propose:

H2: Human capital positively influences tacit knowledge sharing

Social capital reflects relationship stock and quality, visible in interpersonal trust and cooperation. It then can influence organizational growth and development through knowledge sharing (Anklam, 2002; Felício et al., 2014). Moreover, Ganguly et al. (2019) proved that social capital fosters tacit knowledge sharing. Again, we propose:

H3a: Internal social capital positively influences tacit knowledge sharing

Felício et al. (2014) and Dahiyat et al. (2021), showed that social capital has a positive and significant effect on organizational performance. Kianto & Waajakoski (2010) demonstrated that accumulated organizational social capital stimulates growth. Cooperative knowledge is vital to organizational learning and innovation capabilities (Berraies et al., 2020; Rothberg and Erickson, 2018). Social capital facilitates the discovery of opportunities inside and outside the organization and organizes and configures resources needed to use these opportunities (Felício et al., 2014; Uzzi, 1999). Social capital found in formal and informal social networks is a kind of infrastructure for human capital dissemination and transformation into innovative internal and external solutions. Thus, we hypothesize:

H3b: Internal social capital positively influences internal innovativeness
H3c: Internal social capital positively influences external innovativeness

Moreover, Göksel & Aydintan (2017) and Ganguly et al. (2019) established that social capital fosters tacit knowledge sharing. Our hypothesis:

H4a: External social capital positively influences tacit knowledge sharing

Given that social capital influences internal innovativeness, it's reasonable to expect it will also influence external innovativeness. Additional hypotheses include:

H4b: External social capital positively influences internal innovativeness
H4c: External social capital positively influences external innovativeness
Yang et al. (2018) and Kodama (2019) showed that knowledge sharing positively influences innovation. Goffin et al. (2010) and Goffin & Koners (2011) demonstrated tacit knowledge specifically drives new product development. Kucharska (2021a-c) provided mechanisms for how tacit knowledge influences internal organizational innovativeness. So, based on this, the hypothesis is formulated as below:

H5: Tacit knowledge sharing positively influences internal innovativeness

Moreover, Hagedoorn & Wang (2012) suggested complementarity exists between internal and external innovativeness, while Jisr & Maamari (2011) and Jiménez-Jiménez et al. (2008) noted internal process innovations might increase overall innovativeness. Moreover, Donbesuur et al. (2020) suggested external innovations often flow from internal technological innovations. Therefore, internal innovations may significantly support external, market-oriented product innovations, both goods, and services. As a final hypothesis:

H6: Internal innovativeness positively influences external innovativeness

2.1 Mediation expected:

Based on Davidsson & Honig (2003), tacit knowledge previously acquired from startups is particularly influential for entrepreneurs' later ventures. Still, human capital alone is not enough to ensure success. Therefore, internal and external social capital mediates between human capital and tacit knowledge sharing. Further, since social capital shapes cooperative behaviors, it is likely that social capital also mediates between tacit knowledge sharing and internal and external innovation.

2.2 Cross-country study:

Considerable recent work examined these KM and innovation connections in the context of comparisons across countries (e.g., Papa et al., 2021; Totell et al., 2021; Terán-Bustamante et al., 2021; Kucharska 2021a-c). This research follows this line, measuring the above-hypothesized relationships among both Polish and US knowledge workers. This comparison can be interesting, given that the USA is one of the most technologically innovative countries. In contrast, Poland is a post-soviet nation with high ambitions and motivations for development that, however fast-growing, is only 30 years free from the soviet system. Therefore, findings can bring some engaging implications.

3. Method

To verify these assumptions, samples were gathered from January–to February 2020 among knowledge workers in Poland and the US. The questionnaire included filter questions to establish a minimum of one year of work experience in the same company. Measurement scales of the tacit knowledge sharing, internal and external innovativeness constructs source is Kucharska and Erickson (2020), the internal and external social constructs source is Chen et al. (2016), whereas human capital construct scale comes from Kianto et al. (2017). Respondents were also prompted with a short explanation of "tacit knowledge." The core of the survey, excluding classification items, used a seven-point Likert scale to assess the intensity of measured constructs' feelings. Data management was straightforward. Only fully completed questionnaires with SD>.4 were included. Where comparable, the sample generally matched the underlying populations (jobs, gender) of both countries (Statistics Poland, 2017; US Bureau of Labor Statistics, 2020). While some differences were apparent in the underlying populations, they were not sufficiently significant to justify varying the quota targets. Since there is a huge discrepancy in the labor market structure and size between both countries, the Polish quota structure was used as a pattern for both countries' samples. Table 1 presents the characteristics of samples employed in this study. Sample quality was assessed by the KMO measure of sampling adequacy (KMO test), CMV, and Harman single factor tests, and, at this stage, little bias in the US sample has been detected. Further analyses revealed that the US's sample bias does not result from the measurement tool. Still, rather it is an issue caused by the remarkably close correlations between social and human capital observed in the US. Specifically, since samples come from two countries, invariance tests of adequacy were run to verify that the measurement instrument operates properly across the different populations. Invariance was assessed through a multigroup CFA analysis (Byrne, 2016). Both sample sizes are above 1000, so the more liberal model global fit indices (CFI, RMSEA) were applied (Chen, 2007). The measured change in model fit is .002/.019 (unconstrained/measurement/structural model) for CFI and .000/.012 for RMSEA, with an expected value of .01 or less and .015 or less for RMSEA (Byrne, 2016; Chen, 2007; Raudenska, 2020). The national invariance of the measurement tool is confirmed, and the bias observed bias is not the effect of the measurement tool.

Table 1: Sample Characteristics

Characteristic	Poland (n =1050)	USA (n = 1118)
C-suite	3%	3%
Top managers	7%	7%
Middle managers	23%	23%

Characteristic	**Poland (n =1050)**	**USA (n = 1118)**
Professionals	67%	67%
Company size		
Micro (<10 employees)	2%	1%
Small (10-50 employees)	76%	8%
Medium (51-250 employees)	6%	40%
Large (>250 employees)	6%	52%
Age 18-24	1%	2%
25-34	19%	27%
35-44	49%	50%
45-54	21%	16%
55-64	9%	6%
65 and over	2%	1%
Gender Female	50%	49%
Male	50%	50%
Other	0	1%
Industries (33% each)	IT, Construction, Healthcare	

Table 2: Square root of AVE and implied correlations analysis, Poland/US

	AVE	CR	HC	SCext	SCint	TKS	INNint	INNext
HC	.73/.66	.91/.85	**.852/.812**					
SCext	.83/.67	.94/.86	.417/*.856*	**.896/.820**				
SCint	.83/.63	.93/.84	*.89*/.734	.305/.765	**.909/.793**			
TKS	.50/.58	.74/.80	.323/.231	.193/.274	.228/.754	**.707/.761**		
INNint	.54/.63	.82/.90	.346/.816	.366/.823	.39/.261	.326/.326	**.735/.791**	
INNext	.57/.64	.88/.90	.388/.783	.457/.763	.43/.781	.253/.317	.679/.785	**.753/.799**

Note: Poland/USA

4. Results

Findings revealed that internal social capital matters more for organizational innovativeness in the US, whereas in Poland, external and internal capital contribute to organizational innovativeness. Specifically, in the US, internal social capital fully mediates between human capital and tacit knowledge sharing; in Poland, such mediation is not observed, but at the same time, external social capital takes the full mediator function. Furthermore, in Poland, social capital directly influences internal and external innovativeness. In the US – internal social capital act as a strong direct influencer and as a key mediator of innovativeness internal and external.

Figure 1 and Table 3 present details of hypotheses verification.

Table 3: Hypotheses verification

	POLAND n = 1050	**USA n = 1118**
R2	53%	80%
KMO	.924	.953
CMV	74%	71%
Harman one factor test	35%	46%
Cmin/df	3.92	3.75
CFI	.960	.968
TLI	.953	.962
RMSEA	.053	.050
H1a	.73(.000) sustained	.89(.000) sustained
H1b	.42(.000) sustained	.83(.000) sustained
H2	.09(.114) rejected	(.259) rejected
H3a	.13(.028) sustained	.59(.000) sustained
H3b	.27(.000) sustained	.58(.000) sustained
H3c	.15(.000) sustained	.18(.004) sustained
H4a	.12(.004) sustained	-.02(.767) rejected
H4b	.24(.000) sustained	.38(.000) sustained
H4c	.21(.000) sustained	-.02(.702) rejected
H5	.22(.000) sustained	.01(.733) rejected
H6	.54(.000) sustained	.75(.000) sustained

	POLAND n = 1050	USA n = 1118
Mediations analysis – indirect effects analysis		
HC->SCi->TKS	.048(.052) no mediation	.367(.004) full mediation
HC->SCex->TKS	.025(.007) full mediation	-.013(.797) no mediation
TKS->Sci->INNint	.018(.044) complementary mediation	.212(.003) full mediation
TKS-> SCex ->INNint	.015(.007) complementary mediation	-.005 (.787) no mediation
INTint-> SCi ->INNext	.036(.000) complementary mediation	.098(.04) complementary mediation
INTint-> SCex ->INNext	.044(.000) complementary mediation	-.006(732) no mediation

Note: ***p < 0.001; **p < 0.01; *p < 0.05 ML = standardized results

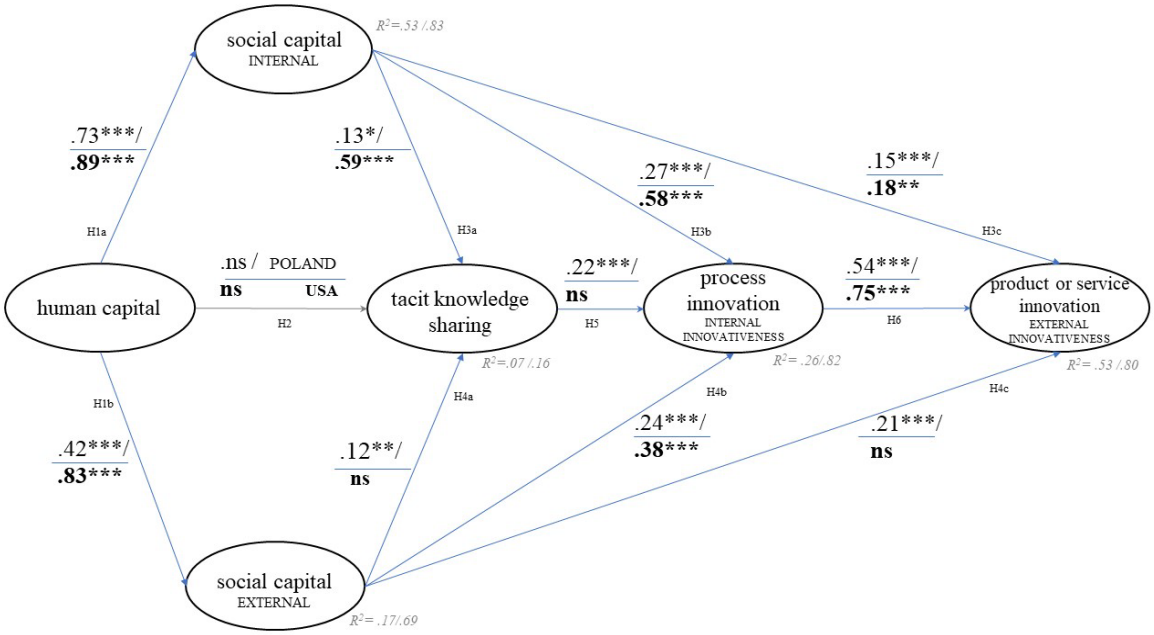

Figure 1: Results visualization

Note: Poland/USA ***p < 0.001; **p < 0.01; *p < 0.05. Poland, n = 1050/USA, n = 1118; Cmin/df=3.92/3.75 CFI=.960/.968 TLI=.953/.962 RMSEA=.053/.050 ML - standardized results

5. Discussion

As illustrated, the majority of the hypotheses fail to be rejected. This is particularly true on the Polish side. The overall fit of the model is good (R^2 = .53), and all hypotheses are supported, with the right sign except for H2. In short, human capital supports both internal and external social capital. Both internal and external social capital support tacit knowledge sharing. All three (internal social capital, external social capital, and tacit knowledge sharing foster internal process innovation. And finally, internal, and external social capital as well as process innovation foster external product innovation. The hypothesis not supported is that human capital has a direct correlation with tacit knowledge sharing.

The results do suggest human capital might have an impact on tacit knowledge sharing through the social capital variables. That can be assessed through the mediation results. As shown, internal social capital fully mediates the human capital to tacit knowledge sharing, but external social capital does not. The other mediations show complementary results: internal and external social capital mediating the tacit knowledge sharing relationship with both types of innovation as well as the internal innovation and external innovation relationship. Altogether, it exposes that internal social capital determines organizational innovativeness in Poland and that human capital is a base for this. The focal meaning of human capital for internal relational capital in Poland was also exposed by Kucharska (2021a).

But contrary to the given model, she explored the influence of tacit knowledge sharing on human capital. The reciprocal relation of both was noted by Garcia-Perez et al. (2020). In this bidirectional knowledge and IC relation context, the meaning of internal social relations among employees seems to be even more critical for innovativeness.

The US results are somewhat different though still largely supported and in a model with a better fit (R^2 = .80). Human capital is correlated with both internal and external social capital. Internal social capital is correlated with tacit knowledge sharing as well as internal and external innovation. External social capital is correlated only with internal innovations. And internal innovation is correlated with external innovation. Not supported is the hypothesis of human capital's relationship with knowledge sharing, similar to the Polish results. Unique to the US results are rejected hypotheses related to external social and its correlation with both tacit knowledge sharing and external innovation, as well as the tacit knowledge sharing and internal innovation connection.

The mediation results for the US are consistent with the role of internal social capital, showing full mediation between human capital and tacit knowledge sharing and between tacit knowledge sharing and internal innovation. Internal social capital also partially mediates the internal innovation and external innovation relationship. No mediation is seen in the role external social capital plays with the other three assessed, mirroring those just reviewed.

To what might we attribute these results? Space is short, and the outcomes should be analyzed further in more detail, but a couple of initial insights are appropriate. Initially, the Polish results clearly demonstrate more use of external social capital and larger networks with stronger ties to those outside the organization. The sample was drawn from Polish IT knowledge workers, similarly to the US, but the Polish sample would tend to match the makeup of the Polish economy, including quite a number of subsidiaries or branches of foreign multinational corporations. While there are homegrown Polish companies, they are not present in the same numbers or the same level of maturity as what might be seen in the US

As a consequence, it's no surprise that Polish organizations use social capital connections to take in knowledge for both internal process improvements and external product innovation. For internal innovation, knowledge could be drawn from both Polish workers as well as those at locations outside Poland. And there is likely more to be shared about process improvements in less mature operations. For external innovation, of course, knowledge from all sources inside and outside would be appropriate. Not only Polish knowledge workers but outside partners or other organizations, as well as customers, could supply knowledge leading to product innovations. Essentially all knowledge solicited from internal social networks and external social networks could be of use to Polish organizations.

In the more mature US economy, one would not be surprised by more self-sufficient approaches to knowledge. For internal process improvements, it might make sense to use all connections (internal and external social capital) to solicit knowledge. The state-of-the-art is important to know in the industry, and best practices can often be gleaned outside the firm as everyone seeks to keep up with current methods. Further, the more advanced processes are probably more likely to be improved by codifiable, sharable knowledge easily applied across applications and locations, perhaps explaining why tacit knowledge sharing is not necessarily important to internal process innovation. External product innovation, on the other hand, is more likely to be intended as proprietary, and so knowledge sharing may be held more closely. Ideas might come from a variety of sources, but the actual knowledge in developing the ideas for product innovation would be more internal and confidential. External social capital would be less important.

A second explanation may have to do with the wider understanding we have about Poland and the US Comparisons of national characteristics are often made in studies such as this. As above, more space would allow a deeper conversation, but as an initial pass, the Hofstede indices can suggest some important differences. Poland is higher than the US on the power distance and uncertainty avoidance scales while lower on individualism (Hofstede Insights, 2020). Those reading suggest respect for authority and a hesitance to stand out or take risks in an uncertain environment. They also suggest a tendency toward a more cooperative environment and less individualism. Those general characteristics square with some of the findings of this study, from the use of all forms of social capital to less risky, less disruption internal process innovations, to an acceptance of knowledge sharing with entities outside the firm, including larger parents and affiliates, or partners.

This research value is the more in-depth exploration of the generally confirmed relationship between human capital and innovativeness (Kucharska, 2021a; Mathew et al., 2021; Wang, 2021).

6. Limitations

The main limitation regarding the included samples is the detected bias. Precisely, for the Polish sample, there is a strong correlation between human capital and internal social capital, whereas for the US sample – there is a strong correlation between human capital and external social capital.

Limitations of the results of this study include the obvious fact that they represent only these two countries and only the IT sector (and the knowledge workers in it). Further, the discriminant validity in the US results is shaky regarding the difference between the two innovation types. The discrimination is clear in the Polish results and also in both countries in two other sectors (healthcare and construction) also covered in the broader study. So, it appears to be more of an issue with US knowledge workers' perception of any difference between internal and external innovation than an instrument problem. Future research could further clarify the factors and look at their patterns across other countries and other industries.

7. Conclusions

This study has presented results from a sizable survey conducted with knowledge workers in the IT sector of both Poland and the US. The student relied on the literature for definitions, constructs, and survey items concerning the perception of human capital levels, sharing of tacit knowledge, the social capital environment both internally and externally, and perceived levels of internal process innovation and external product innovation. Structural equation modeling was used to explore hypotheses suggesting human capital drives tacit knowledge sharing and internal/external social capital, which then relate to internal process innovation, which then, along with the internal/external social capital, correlates with external product innovation.

The hypotheses were generally confirmed for both countries. The full range of relationships was clearer in Poland. Human capital does affect internal and external social networks. Those social networks, along with shared tacit knowledge, do correlate with internal process innovation. And the internal/external social networks then work alongside internal process innovation to drive external process innovation. Essentially all sources of human capital, but especially tacit knowledge, interact with both types of social capital to drive innovation. And internal innovation further influences external innovation.

In the US, the pattern is similar except for the impact of external social capital, which is important only to internal innovation. Tacit knowledge sharing also fails to link to internal innovation. In the US, it appears the respondents perceive internal process improvements to rely more on internal human capital and not of the tacit variety. Further, both types of social capital support those process improvements, suggesting knowledge comes from a wide variety of sources. But only internal social capital is linked to external product innovation, perhaps because of its more proprietary nature.

The study shows the importance of evaluating human capital and innovation from a variety of perspectives. The variables and supporting conditions such as social capital can and do vary by industry and country. Research concerning these factors from more industries and more countries will further clarify what is more universally similar as well as what differs. All should lead to a deeper understanding of the impact of variables such as tacit knowledge, social capital, and others on organizational performance.

Acknoowledgements

Funding Acknowledgement: The presented research results from the Tacit Knowledge Sharing Influence on Innovativeness. The Sector Analysis, project No. UMO-2018/31/D/HS4/02623 is financed by the National Science Center of Poland (Narodowe Centrum Nauki-NCN).

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