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Knowledge Integration as a Source of Competitive Advantage in Large Croatian Enterprises

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Abstract: The paper discusses the integration of codified and tacit knowledge as a potential source of competitive advantage. The management of explicit knowledge is viewed through knowledge management practices, whereas the management of tacit knowledge is conceptualised through strategic human resource management. The paper presents the empirical results of testing of low- and high-synergy models of knowledge integration on a representative sample of large Croatian enterprises.

Keywords: knowledge integration, knowledge management, strategic human resource management, competitive advantage
Categories: A, H

1 Knowledge Integration

According to the resource-based view, a firm's competitive advantage is built on a set of strategically relevant resources[1] (cf. [Barney, 1991], [Grant, 1991], [Peteraf, 1993]). If firms have access to similar resources, competitive advantage will be enjoyed by the firms possessing strategic capabilities that determine the efficiency of transformation of inputs into outputs, i.e. of "activating" resources. Such capabilities stem from the nature of organizations as complex social routines [Collis, 1994]. Among various strategic resources and capabilities, a pivotal role is often assigned to knowledge – as both a resource in itself and an integrating factor that makes other resources and capabilities effective – especially in complex and dynamic environments. Moreover, a firm can be viewed as a mechanism for coordinating individual knowledge ([Grant, 1996a]; [Spender and Grant, 1996]; [Spender, 1996]). In such a view, actual forms in which strategic capabilities materialize are nothing else than expressions of different knowledge levels [Grant, 1996b]. Capabilities can thus be represented by a hierarchy of knowledge, skills & abilities, ranging from the single-task capabilities required to perform a single functional task to cross-functional capabilities, requiring the complex integration of knowledge of different teams and organizational units. Moving up the 'capability pyramid' requires a higher effort to coordinate different forms of knowledge, as well as individuals and organizational entities controlling it. Following [Grant 1996b], we argue that success of knowledge

[1] Resources include all tangible and intangible items controlled by the enterprise.

integration may be the crucial source of the firm's competitive success. This particularly pertains to the capability of coordinating not only the explicit knowledge, which is subject to codification and storing in formal repositories, but also the tacit one, which resides in employees. Despite partial codification of knowledge, which enables its wider dissemination, the acquisition, interpretation and implementation of all knowledge in concrete business situations remains inextricably linked to human participation. The issue of knowledge integration thus brings into focus the relationship between knowledge and human resources that utilize it - both of which can be viewed as strategic assets. The strong link between the human resources and knowledge should be discernible at theoretical and practical levels alike: it should result in a theory of knowledge as a strategic asset that is generated and utilized through human resources, as well as in coordinated approach to management of both aforementioned forms of strategic assets. Although conceptual arguments emphasizing the need to integrate different forms of knowledge are not a novelty (cf. [Buble & Alfirević, 2002)], there is a lack of empirical research on knowledge integration as a potential source of competitive advantage.

As a step in that direction, this paper empirically tests the hypothesis of knowledge integration as a pivotal source of competitive advantage, by analyzing a sample of large Croatian enterprises (see below). The acknowledgment of the dual (i.e. explicit and tacit) nature of knowledge is reflected in analyzed managerial practices. Explicit components of knowledge can be steered through effective Knowledge Management (KM), whereas the tacit component can be influenced by organizational learning, knowledge interpretation and other factors that comprise Strategic Human Resource Management (SHRM).

2 Empirical Analysis of Knowledge Integration

The research has attempted to evaluate the level to which knowledge management and human resource management are integrated into the respondents' strategy. That entailed an analysis of i) whether the activities of knowledge management and strategic human resource management are implemented at all and ii) whether those resources can be viewed as sources of the firm's competitive advantage.

The evaluation of strategic integration of knowledge management practices is based upon the model proposed by [Meso and Smith, 2000]. This approach views the production of knowledge, gathering and conversion of existing knowledge into the most appropriate form as the crucial activities of any knowledge management system. Consequently, the data on the following practices have been gathered: i) organized gathering of existing knowledge from the environment, ii) creation of new explicit knowledge, iii) activities supporting the transmission and creation of new tacit knowledge, iv) formalization of tacit into explicit knowledge, and v) creation of an information system for storage and transfer of knowledge within the organization. Each of these variables can take on the value of 0 or 1 (depending whether the activity is being performed or not), and their sum comprises a composite KM indicator, taking on values on the scale between 0 (no KM-related activities) and 9 (the most advanced level of KM activities).

Evaluation of the level to which human resource management is integrated into strategic management of the enterprise is based is based upon a modification of the

Truss' model of SHRM (cf. [Gratton et al., 1999]), which singles out the following determinants: i) whether the HR manager is a Board member, ii) to what extent is the HR department involved in strategy formulation, iii) whether the employees are explicitly mentioned in the company's mission statement, iv) whether an HR strategy exists, v) whether the HR strategy is defined – implicitly or explicitly – in any of the company's documents. Furthermore, an additional component has been addressed: vi) the existence of formal HR management plans. In the same vein as above, each component takes on the value of 0 or 1, contributing to the value of the composite SHRM indicator, which range between 0 (no strategic integration of HRM) and 9 (the highest possible level of SHRM practice).

In the evaluation of strategic significance of knowledge and human resources, an appraisal by the surveyed top managers has been used. This evaluation has been designed as a combination of methodologies proposed by [Barney, 1991] and [Grant, 1991] – based on the criteria of rareness, imperfect mobility, the lack of strategic equivalents [Barney, 1991], limited transferability and replicability [Grant, 1991]. The composite indicator of strategic significance of the knowledge resource has been computed by quantifying the responses on the Likert scale (with five levels of (dis)agreement with the claims) and subsequent calculation of the mean.

Neither the strategic valuation of knowledge nor the appropriate practices of KM and SHRM guarantee the development of a capability that would multiply the effects of the individual forms of knowledge, and thus achieve the synergy of explicit and tacit knowledge, which might be discernible as sustainable competitive advantage. However, it is expected that knowledge-integrating capability acts as a coordination engine of explicit and tacit knowledge, thereby facilitating synergetic effects on the performance of the firm. Two theoretical possibilities are discussed. The first model assumes either nonexistent, or a very low level of synergy, which causes the performance effect of the SHRM/KM integration (as a measure/indicator of the competitive advantage) to be linear. In other words, it is presumed that there is a linear statistical relationship between performance and values of indicators describing the SHRM and KM practices and their perceived (strategic) value (Performance = f (SHRM+KM)). The other model assumes a high level of synergy between the two knowledge-integrating practices in terms of performance effects, whereby the SHRM/KM integration produces the statistically relevant multiplication effect (Performance = f (SHRM * KM)). Consequently, the assumptions of low- and high-synergy models are modeled by adding up and/or multiplying the original KM and SHRM indicators.

Furthermore, the effect of knowledge-based resources (and their eventual synergies) on the actual strategic performance and the competitive position (approximated by the financial performance of the enterprise) is analysed. Hereby performance is defined in terms of returns on equity, total assets and sales, by following the traditional accounting model of enterprise performance[2]. The proposed model postulates that KM and SHRM and knowledge integration lead to competitive advantage and above-average financial returns. Consequently, if the model is correct, the indicators of financial performance should be highly positively correlated with the

[2] For a comprehensive overview of measuring both the financial and non-financial aspects of strategic performance , see: Rejc, in: [Buble, Pučko et al., 2003], pp. 50-62.

composite indicators of KM and SHRM, as well as with the indicators of perception of strategic value of knowledge-based resources. Since SHRM i KM are long-term strategic programs, any eventual financial results should be generated with a time lag.

3 Empirical Evidence from the Large Croatian Enterprises

3.1 Research sample and methodology

The research project has been undertaken on the population of large non-diversified corporations in Croatia (except for financial institutions, whose competitive logic is deemed to be specific), provided that they conduct business in a competitive market. The definition of size has followed the European Commission Directive 96/280, which has been somewhat simplified: the main criterion was the number of full-time equivalent employees, with the threshold set at 250 individuals. The legal independence and non-diversification ensured the identification of enterprises with autonomous corporate strategies. Such a definition of the unit of analysis has resulted in a population of 324 enterprises, all of which received a questionnaire addressed to the CEO or the Board member in charge of corporate strategy. The response rate was 17 per cent, which is slightly above-average for similar European studies of organizational change (cf. [Whittington, Pettigrew, et. al., 1999]).

3.2 Research results

The research results provide a reasonable amount of support for the postulated hypotheses, but also open op issues for future research. We start with the self-assessment of involvement in KM and SHRM activities in surveyed enterprises. More than a quarter of them demonstrate a very high level of integration of human resource management into into the process of strategic management, with the median value of 4 (with a value range of 8). The number of reported KM activities looks even more impressive. The median enterprise reported 6 of them (with a value range of 9). Although it can be questioned whether these practices are perceived totally consistently across firms, the further discussion of this issue is outside the scope of this paper.

We then analyse the values of composite indicators of strategic value of human resources, understood as carriers of tacit knowledge, and the supporting systems and practices, in relation to formalised knowledge and the accompanying systems and practices. Median values of these indicators were 3.0 for human resources and the supporting HRM systems and practices, and 3.2 for knowledge and the supporting KM systems and practices. Thus, the perception of strategic significance of knowledge-based resources is relatively high, but KM is valued more highly than SHRM. This is also reflected in the values of indicators of appropriate KM and SHRM practices. Median values of KM indicators consistently surpass the SHRM ones; the latter also demostrate a higher level of dispersion.

We then analyse the impact of knowledge-based resources and their eventual synergies on the financial performance, Table 1. shows results of the correlation analysis between the financial performance and the determinants of SHRM and KM as strategic resources. Due to the use ordinal data, Spearman correlation coefficient, as a non-parametric form which takes into account the ranking, has been used.

Spearman correlation coefficient	*ROA 2001.*	*ROE 2001.*	*ROS 2001.*	*Assessment of KM practice*	*Value of KM as a resource*	*Assessment of SHRM practice*	*Value of SHRM as a resource*
ROA 2001.	1,000	**,591****	**,755****	-,024	,026	,060	,133
ROE 2001.		1,000	,286	,192	-,016	,274	-,138
ROS 2001.			1,000	,094	-,102	,086	,030
Assessment of KM practice				1,000	*,296**	**,410****	,194
Value of KM as a resource					1,000	,160	**,641****
Assessment of SHRM practice						1,000	,107
Value of SHRM as a resource							1,000

Source: Research results (N = 27 / 55)[3]

** The results are significant at 1 per cent (i.e. the confidence level is 99 per cent).

* The results are significant at 5 per cent (i.e. the confidence level is 95 per cent).

Table 1: Correlation between indicators of management and strategic significance of knowledge-based strategic resources, and the financial performance of an enterprise (2001)

Table 2 illustrates the results of analysis with the financial data from 2000, which utilises the full data set. It is important to note a strong and statistically significant relationship between KM practices and financial performance of an enterprise**.** Unfortunately, such a conclusion cannot be drawn for other SHRM and KM indicators.

In both cases, the enterprises engaged in more KM activities not only appreciate the strategic significance of KM, but also engage in more SHRM activities, which supports the assumption of their interdependence and the necessity of knowledge integration, i.e. coordinated management of different knowledge forms. KM practices are valued as strategically significant. Perhaps surprisingly, the appreciation of the strategic significance of SHRM does not match the actual engagement in SHRM practices. The conclusion about the strategic significance of HRM in large Croatian enterprises cannot be made.

The next step was to test the correlation between knowledge integration indicators (defined through low- and high-synergy interaction of KM and SHRM, as outlined above) and financial performance. Due to ordinal variables, Spearman coefficient is used again. Table 3 shows the relationships between the indicators of combined effects of knowledge-based resources and financial performance for 2001.

[3] The correlation coefficients between indicators of relative financial performance (ROA, ROE, ROS) and the indicators of management of knowedge-based resources is based on a non-complete data set (N=27). The correlation coefficients between indicators of management of knowedge-based resources utilised the full data set (N=55). The same aplies to all other forms of statistical analysis which utilises the data on financial performance from 2001.

As in the case of individual correlations, there are no strong or significant statisical relationships in the area of interest (lighty shaded cells - see the note below).

Spearman correlation coefficient	*Assessment of KM practice*	*Value of KM as a resource*	*Assessment of SHRM practice*	*Value of SHRM as a resource*	*ROA 2000.*	*ROE 2000.*	*ROS 2000.*
Assessment of KM practice	1,000	*,296**	**,410****	,194	*,322**	**,387****	*,314**
Value of KM as a resource		1,000	,160	**,641****	-,014	,006	-,031
Assessment of SHRM practice			1,000	,107	,123	,259	,011
Value of SHRM as a resource				1,000	,094	,041	,087
ROA 2000.					1,000	**,870****	*,950**
ROE 2000.						1,000	*,769**
ROS 2000.							1,000

Source: Research results (N = 55)

** The results are significant at 1 per cent (i.e. the confidence level is 99 per cent).

* The results are significant at 5 per cent (i.e. the confidence level is 95 per cent).

Table 2: Correlation between indicators of management and strategic significance of knowledge-based strategic resources,and the financial performance of an enterprise (2000)

Spearman correlation coefficient	*ROA 2001.*	*ROE 2001.*	*ROS 2001.*	*KM + SHRM practices*	*Value of the KM + SHRM resource*	*KM X SHRM practices*	*Value of the KM X SHRM resource*
ROA 2001.	1,000	**,591****	**,755****	,024	,075	,061	,097
ROE 2001.		1,000	,286	,261	-,114	,283	-,106
ROS 2001.			1,000	,105	,017	,111	,043
KM + SHRM practices				1,000	*,281**	**,979****	,278
Value of the KM + SHRM resource					1,000	,263	**,997****
KM X SHRM practices						1,000	,263
Value of the KM X SHRM resource							1,000

Source: Research results (N = 27 / 55)

** The results are significant at 1 per cent (i.e. the confidence level is 99 per cent).

* The results are significant at 5 per cent (i.e. the confidence level is 95 per cent).

Note: The are of interest for the relationship between knowledge integration and financial performance

The area with artificial strong and significant correlation due to the model of construction of indicators[4]

Table 3: Correlation between the indicators of knowledge integration and financial performance (2001 data)

When the financial results for 2000 are taken into consideration, we discern strong and significant correlations between the indicators of integration of KM and SHRM, and return on equity. Than is probably related to high correlation between knowledge management and financial performance. Somewhat surprisingly, the correlation in the case of the low-synergy model is somewhat stronger than in the case of the high-synergy model. That does not need to imply a disqualification of the assumed direction of the relationship, but it necessitates an additional regression analysis. Furthermore, there is almost no relationship between performance and perception of stratefic significance of the knowledge-based resource complex.

[4] An indicator defined as "A+B" will obviously show almost perfect correlation with an indicator defined as "A X B".

Spearman correlation coefficient	*ROA 2000.*	*ROE 2000.*	*ROS 2000.*	*KM + SHRM practices*	*Value of the KM + SHRM resource*	*KM X SHRM practices*	*Value of the KM X SHRM resource*
ROA 2000.	1,000	**,870****	**,950****	,262	,049	,266	,062
ROE 2000.		1,000	**,769****	**,369****	,017	*,360**	,034
ROS 2000.			1,000	,189	,043	,171	,050
KM + SHRM practices				1,000	*,281**	**,979****	,278
Value of the KM + SHRM resource					1,000	,263	**,997***
KM X SHRM practices						1,000	,263
Value of the KM X SHRM resource							1,000

Source: Research results (N = 55)

** The results are significant at 1 per cent (i.e. the confidence level is 99 per cent).

* The results are significant at 5 per cent (i.e. the confidence level is 95 per cent).

Note: The are of interest for the relationship between knowledge integration and financial performance

The area with artificial strong and significant correlation due to the model of construction of indicators

Table 4: Correlation between the indicators of knowledge integration and financial performance (2000 data)

In order to estimate the relationship between knowledge-based resources and supporting systems and practices with the enterprise performance (measured by ROE), the multiple regression analysis is subsequently undertaken (based on the 2000 data), resulting in statistically significant models of knowledge integration in low-synergy and high-synergy cases alike. Financial data for 2001 has not been taken into account, because correlation analysis has not indicated any information about the expected relationships between variables. Table 5. shows the results of tested regression models based on their crucial characteristics: coefficient of determination R^2 (indicating how much of the variance between predicted and actual values does the model actually explain); adjusted coefficient of determination R^2 (deemed as a more "conservative" estimate than the previously described one); F-test significance (which indicates the statistical significance/acceptability of the entire model); and colinearity index (whose value may indicate the problem of strong correlation of independent variables, which would be a significant violations of the assumptions behind the statistical model).

Dependent variable	Independent variables	R^2	Adj. R^2	F-test signif. (< 0,05 ?)	Colinearity index (< 15 ?)
ROA 2000	Indicator of SHRM practices; Indicator of KM practices; Value of SHRM as a resource; Value of KM as a resource.	0,087	0	0,417 → non-significant model	22,66 → medium multicolinearity
ROE 2000	Same as above.	0,207	0,128	2,611 → non-significant model	22, 39 → medium multicolinearity
ROS 2000	Same as above.	0,088	0,002	0,409 → non-significant model	22,66 → medium multicolinearity
ROE 2000	Indicator of KM practices	0,175	0,156	0,004 → significant model	5,468 → no multicolinearity
ROE 2000	Total number of SHRM and KM activities under the low-synergy assumption (SHRM + KM); Perception of SHRM and KM activities strategic value under the low-synergy assumption.	0,164	0,144	0,006 → significant model	6,02 → no multicolinearity
ROE 2000	Total number of SHRM and KM activities with the high-synergy effects accounted for (SHRM x KM); Perception of SHRM and KM activities strategic value under the high-synergy assumption.	0,158	0,117	0,027 → significant model	7,192 → no multicolinearity
ROE 2000	Total number of SHRM and KM activities under the low-synergy assumption (SHRM + KM).	0,164	0,144	0,006 → significant model	6,03 → no multicolinearity

Source: Research results (N = 55)

Table 5: Parameters of linear regression models

All presented (linear) regression models assume a linear relationship between variables. The analysis has resulted in a number of correct models, which were significant and in accordance with all statistical assumptions; these models are shown in the shaded area. The suggested model of low-synergy knowledge integration is statistically significant, but it explains a relatively modest part of 16.4 per cent of square deviation within the model which measures performance in terms of return on

equity. The model of high-synergy knowledge integration is also statistically significant, but it explains slightly less than 16 per cent of square deviation, also with performance measured by ROE.

4 Concluding Remarks

In a highly volatile business environment of the "new economy", knowledge is an important strategic resource; the same applies to strategic capabilities related to its activation. However, when it comes to management of intellectual potential of an enterprise, it seems that contemporary literature emphasises too strongly the disciplinary divisions (e.g. organizational learning, knowledge management, (strategic) human resource management). In this context, the concept of knowledge integration can be viewed as a possible solution to the problems of research and management of knowledge (and intangible assets in general). It is argued that such a concept deserves an adequate empirical attention, which would lead to its possible refinement and validation.

Therefore, a research project that involved a sample of large Croatian enterprises has been conducted. It has been demonstrated that separate aspects of management of intellectual potentials of an organisation (SHRM & KM) are relatively widespread in such enterprises. Since we are dealing with a transition economy, these results seem commendable. Although there are indications of eventual acceptability of one of the proposed models of impact of knowledge integration on competitive advantage (measuerd by traditional financial performance indicators), it is not possible to reach final conclusions regarding the proposed theoretical constructs. This might be partly due to a relatively low sophistication of Croatian business environment, including the inadequate knowledge and perceptions of manageres regarding the implementation and evaluation of KM and SHRM practices. That necessitates further research in the context of developed market economies, as well as comparative studies. It would also be useful to consider alternative tools for measurement of strategic performance, which would take into account modern measures of financial performance (e.g. economic value added, market capitalisation etc.), as well as measures of non-financial performance (e.g. Balanced Scorecard).

References

[Barney, 1991] Barney, J. B.: "Firm Resources and Sustained Competitive Advantage", *Journal of Management*, 17, 1 (1991), 99-120.

[Buble and Alfirević, 2002] Buble, M.; Alfirević, N.: "Contemporary Concepts of Sustainable Competitive Advantage – Implications for Management of Human and Knowledge Assets", *Proceedings of the International Conference "An Enterprise Odyssey: Economics and Business in the New Millenium 2002"***,** Graduate School of Economics & Business, Zagreb, 154-155.

[Buble and Pučko, 2003] Buble, M.; Pučko, D.; et al.: "Successful Competitive Strategies of Large Croatian and Slovenian Enterprises (Research Report", *Management***,** 8, 1, 2003, 1-112.

[Collis, 1994] Collis, D. J.*:* "Research Note: How Valuable are Organizational Capabilities?", *Strategic Management Journal*, 15, (1994), 143-152.

[EC, 1996] European Commission: "96/280/EC: Commission Recommendation of 3 April 1996 concerning the definition of small and medium-sized enterprises", EC, Bruxelles (1996).

[Grant, 1991] Grant, R. M.: "The Resource-Based Theory of Competitive Advantage: Implications for Strategy Formulation", *California Management Review***,** 33, 3 (1991), 114-135.

[Grant, 1996a] Grant, R. M.: "Toward a Knowledge-Based Theory of the Firm", *Strategic Management Journal***,** Vol. 17 (Winter Special Issue), 1996(a), 109-122.

[Grant, 1996b] Grant, R. M.: "Prospering in Dynamically-competitive Environments: Organizational Capability as Knowledge Integration", *Organization Science*, 7, 4 (1996b), 375-387.

[Gratton et al., 1999] Gratton, L.; Hope-Hailey, V.; Stiles, P.; Truss, C.: *Strategic Human Resource Management*, Oxford University Press, Oxford (1999).

[Meso and Smith, 2000] Meso, P.; Smith, R.: 'View of Organizational Knowledge Management Systems', *Journal of Knowledge Management***,** 4, 3 (2000), 224-234.

[Peteraf, 1993] Peteraf, M. A.: "The Cornerstones of Competitive Advantage: A Resource-based View", *Strategic Management Journal***,** 14, 3 (1993), 179-192.

[Spender and Grant, 1996] Spender, J. C.; Grant, R. M.: "Knowledge and the Firm: Overview", *Strategic Management Journal***,** 17, Winter Special Issue, 1996, pp. 5-9.

[Spender, 1996] Spender, J. C.: "Making Knowledge the Basis of A Dynamic Theory of the Firm", *Strategic Management Journal*, 17, Winter Special Issue, 1996, 45-62.

[Whittington et al., 1999] Whittington, R.; Pettigrew, A.; Peck, S.; Fenton, E.; Conyon, M.: "Change and Complementarities in the New Competitive Landscape: A European Panel Study, 1992-1996", *Organization Science***,** 10, 5 (1999), 583-600.