

The Relationship between Knowledge and Green Logistics: a Theoretical Approach

Antonio Mihi-Ramirez, Lina Girdauskiene

Granada University
Campus cartuja, 18071 Granada, Spain
e-mail: amihi@ugr.es

Kaunas University of Technology
K. Donelaicio st. 73, LT-44029, Kaunas, Lithuania
e-mail: lina.girdauskiene@ktu.lt

crossref <http://dx.doi.org/10.5755/j01.ee.24.3.3312>

We present a research about the widely accepted knowledge management modes and their interaction with important and fresh processes for the company as the reverse logistics activities, commonly called "green logistics". Knowledge is an important intangible for any area of the organization, especially in the case of logistics of products that are returned to organization because it implies a huge uncertainty and costs. Due to new customer policies, new and higher environmental laws and recover of discarded materials which supposes a new low cost source of raw material the returns are increasing for the companies. The relationship between both areas establishes new and positive effects on flexibility and performance of the organization. Due to the complexity and extension of this research we have divided it into two papers, this first one represents the theoretical background of this research, and the second paper is focused on the empirical contrast of hypothesis and results for this investigation. Thus, this first article has shown a theoretical approach regarding how the modes of knowledge conversion, specifically the creation of knowledge, affects reverse logistics and analyses new relations between these variables and their joint influence on the flexibility of distribution of information (because information has a key role for these variables) and performance of the organization. A second paper will show the empirical contrast for these constructs.

Keywords: *reverse logistics, knowledge creation, flexibility of distribution of information, organizational performance.*

Introduction

Knowledge has become one of the most important intangible assets for the company in this new economic scenery (Kess & Haapasalo, 2002; Li *et al.*, 2009; Nonaka, 1994), being of particular importance in the process of creating knowledge within the organization (Nonaka, 1994; Nonaka & Konno, 1998). Similarly, consideration of a reverse flow in the Logistics function amplifies competitive capabilities of the company (Kenne *et al.*, 2012). The study of this whole product flow in the opposite way and how to deal with all the consequences that entails for the organization is what has been called in recent years reverse logistics or green logistics (Dowlatshahi, 2000; Rogers & Tibben-Lembke, 1999, 2001; Tibben-Lembke & Rogers, 2002).

Reverse logistics activities are becoming significant to the companies due to the increasing product returns because of the new customer policies, new and higher environmental laws, and because recovering of discarded materials supposes a new low cost source of raw material (Rogers & Tibben-Lembke, 1999, 2001). Reverse logistics requires an adequate knowledge management in all phases of returning the product to help solving the problems it faces in these processes (Wadhwa & Madaan, 2007). In this sense it will be essential for the organization to have the ability to generate new knowledge in order to reduce the high uncertainty of reverse logistics activities (Arrow,

1962; Galbraith & Kazanjian, 1986). Giving to it greater flexibility allows expanding its capacity and responding to the continuous changes that occur in these activities.

Moreover, flexibility of distribution of information is crucial because in reverse logistics the management of information depends on information systems that improve the data processing operations to facilitate or help managers making better decisions (Swafford, 2003). Furthermore, flexibility of distribution of information is a key dimension for the performance of operations system and fundamental requirement for the survival of the firm (Hitt *et al.*, 1998; Kuo *et al.*, 2006) adapting it to a constantly changing environment (Hitt *et al.*, 1998; Koste & Malhotra, 1999).

Finally we should take into account the role of knowledge creation and reverse logistics as tools that motivate, guide and improve individual decision making, affecting the performance of the organization (Arias, 2003).

For these reasons and due to the increasing importance of these variables, the aim of this paper is to analyze the relationship of possible implication between creation of knowledge and reverse logistics, and also to examine its influence on the flexibility of distribution of information and the organizational performance. We have summarized our research in the figure 1.

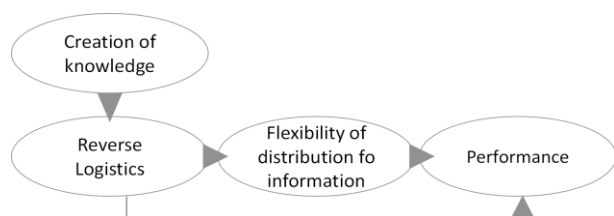


Figure 1. Analyzed variables in the research

So this research constitutes the first joint analysis of the relationship between increasing important areas of the organization: knowledge, reverse logistics, and their effects on key requirements for the existence of the firm: flexibility and performance.

In order to analyze a creation of knowledge we are going to consider the four modes of knowledge conversion of this popular model of knowledge creation by Nonaka and Takeuchi (1995), socialization, externalization, internalization and combination, studying each of the relations between these modes of knowledge conversion. Then we will analyze the modes of knowledge creation and its relationship to reverse logistics. Also we will analyze the influence of the processes of knowledge creation and reverse logistics on operational flexibility (Bernardo and Mohamed, 1992), and within this one, we are focusing on flexibility of distribution of information, which refers to the ability to distribute and process information and the ease of sharing it (Brancheau *et al.*, 1996; Byrd & Turner, 2000; Chanopas *et al.*, 2006; Henderson & Clark, 1990; Robertson & Sribar, 2002; Sánchez & Mahoney, 1996; Takeuchi & Nonaka, 1986). Finally, we will analyze how reverse logistics processes and flexibility of distribution of information affect the performance of the firm, because it is essential for effective management of any organization (Griffis *et al.*, 2007). Accordingly, this research is divided into two papers, thus, in this first part we have showed the theoretical background of this research, and in the second paper we will present the empirical contrast of hypothesis and results for this investigation. Therefore, in the next section the different relationships between these variables are going to be analyzed.

Theoretical approach to relations between knowledge and green logistics

The knowledge modes

Various studies have revealed the crucial role of knowledge to achieve organizational success (Kylaheiko *et al.*, 2011; Kogut & Zander, 2003; Li *et al.*, 2009; Matusik & Hill, 1998; Nonaka & Takeuchi, 1995; Zack, 1999). The knowledge creation model of Nonaka and Takeuchi (1995) is the most cited so far to explain the process of knowledge creation. This model considers four possible modes of knowledge conversion: socialization, externalization, combination and internalization where explicit and tacit knowledge interact (Nonaka & Takeuchi, 1995). About the creation of knowledge there are numerous theoretical researches on this area, as the book *The Knowledge-Creating Company* by Nonaka and Takeuchi (1995), or also the special issue of magazines such as, for example, the winter special issue of the *Strategic Management*

Journal (1996), the spring issue of *California Management Review* (1998) and even journals such as *Journal of Knowledge monographic Management* which began publishing its first articles since January 1998.

In the empirical research by Nonaka and Takeuchi (1995) documented cases occurred as examples to illustrate how four modes relate to each other (Nonaka and Takeuchi, 1995, 11-13, 69-70, 76-78, 86-87). According this, the explicit knowledge of externalization becomes a new superior explicit knowledge through combination processes that disseminate it in the organization (Nonaka & Takeuchi, 1995; Nonaka & Toyama, 2003, Nonaka *et al.*, 1994; Nonaka *et al.*, 2000).

Thus, we can summarize that the combination of knowledge is positively related to the externalization of knowledge. Both in combination and socialization the knowledge is shared within the organization. In combination the new superior explicit knowledge is disseminated within the company, while the socialization is shared experiences and mental models to collectivize existing tacit knowledge in individuals of the organization (Nonaka & Takeuchi, 1995, Nonaka *et al.*, 2000). In the research of Nonaka *et al.*, (1994) there is empirically analyzed the 4 dimensions of knowledge creation raised by these authors and the relationship between each of these dimensions, and the confirmatory analysis of the relationship between socialization and combination showed the highest values, it proved that these variables are the dimensions with the most significant relationship of all this analysis (Nonaka *et al.*, 1994). Documented case studies that confirm this relationship (Nonaka 1991, 98-99; Nonaka, 1994, 19; Nonaka & Takeuchi, 1995, 62-64; Nonaka *et al.*, 2000, 17) can also be found there.

Thus, in short the combination of knowledge is positively related to the socialization of knowledge.

The new superior explicit knowledge obtained and shared through the combination is applied and used in practical situations that are the basis of new organizational routines, becoming new tacit knowledge by individuals of the organization through the process of internalization (Nonaka, 1991; Nonaka, 1994; Nonaka & Takeuchi, 1995; Nonaka & Toyama, 2003; Nonaka *et al.*, 2000). In addition, dissemination of explicit knowledge of the combination is also produced by the processes of internalization (Nonaka & Takeuchi, 2000). And we can also find documented cases confirming this relationship (Nonaka & Takeuchi, 1995, 70, 117-120).

Thus, we propose that the combination of knowledge is positively related to internalization of knowledge.

Tacit knowledge achieved through socialization becomes explicit knowledge to be shared by externalization in the organization (Nonaka & Takeuchi, 1995; Nonaka & Toyama, 2003). So it is especially important in both processes that participants can share time and space to work through direct experience for the interaction of these tacit and explicit knowledge (Nonaka & Toyama, 2003). Therefore, tacit knowledge is articulated socialization into explicit forms through externalization activities (Li *et al.*, 2009).

Thus, we propose that the externalization of knowledge is positively related to socialization of knowledge.

Tacit and explicit knowledge are complementary and can extend over time through processes of mutual interaction (Nonaka & Takeuchi, 1995; Nonaka & Toyama, 2003; Nonaka *et al.*, 1994; Nonaka *et al.*, 2000). This interaction involves two distinct operations closely related (Nonaka & Takeuchi, 1995). One is the conversion of tacit knowledge into explicit knowledge, called externalization (Nonaka, 1991; Nonaka, 1994, Nonaka & Takeuchi, 1995). And the other is the conversion of explicit knowledge into tacit knowledge, called internalization (Nonaka, 1991; Nonaka, 1994, Nonaka & Takeuchi, 1995). In activities of the externalization, individuals can put your new tacit knowledge acquired in the form of words or technical specifications, making explicit knowledge (Nonaka, 1991; Nonaka, 1994, Nonaka & Takeuchi, 1995, Nonaka & Toyama, 2003). Also in internalization individuals can create and read documents helping them internalize their experiences (Li *et al.*, 2009; Nonaka & Takeuchi, 1995; Nonaka *et al.*, 2000). Thus, externalization activities and internalization involve the interaction of the epistemological dimension of knowledge (Li *et al.*, 2009; Nonaka & Takeuchi, 1995; Nonaka *et al.*, 2000).

In short the externalization of knowledge is positively related to internalization of knowledge.

The creation of knowledge and reverse logistics

Gradually, with the increase of published papers on logistics and reverse logistics (Kenne *et al.*, 2012) some studies have emerged that examine, at first, the relationship of logistics with the creation of knowledge (Arlbjorn & Halldorsson, 2002; Christopher, 1994; Stentoft & Halldorsson, 2002; Wadhwa & Madaan, 2004, 2007).

Whatever is the perspective when analyzing knowledge creation on reverse logistics, a key element in this process is information (Stentoft & Halldorsson, 2002). Information in reverse logistics activities has many origins, and its proper management and organization is essential for the development of reverse logistics activities (Wadhwa & Madaan, 2004, 2007). Information requires complex planning and control, impeded by the high uncertainty in reverse logistics processes (Wadhwa & Madaan, 2004, 2007). Also information has a key role in reverse logistics and is a minimizer of uncertainty (Arrow, 1962; Galbraith & Kazanjian, 1986) in the decision making process, coordination of activities (Ketzenberg *et al.*, 2004) and planning (Murdick & Munson, 1988). Proper storage is particularly critical to achieve efficiency in reverse logistics operations (Daugherty *et al.*, 2002). For its part, knowledge is an intangible more complex which consists of information structures (Rivero, 2002). The creation of this knowledge in reverse logistics activities by employing a multitude of resources is changing and diverse fundamental (Wadhwa & Madaan, 2004), due to the high degree of uncertainty regarding the timing and amount of material returned in such existing activities (Ketzenberg, 2004; Wadhwa & Madaan, 2007). Thus, in the reverse logistics process, the creation of knowledge has an important role, could be applied in reverse logistics with a high degree of success (Nonaka & Konno, 1998; Wadhwa & Madaan, 2007), since by means of the four modes

conversion is stored and retrieved this information logistics, generating knowledge in the different stages of reverse logistics flow is very important in the generation of value to the organization (Nonaka & Konno, 1998).

In particular, through internalization the explicit knowledge of how the product returned to the organization is shared and understood by people not directly lead the process, improving decision-making (Nonaka & Konno, 1998), and becomes new tacit knowledge by individuals throughout the organization through the processes of internalization (Nonaka, 1994; Nonaka & Takeuchi, 1995; Nonaka & Toyama, 2003, Nonaka *et al.*, 2000).

Therefore, we can say that activities of internalization are affecting reverse logistics.

Furthermore, while some companies have a history of information that let them to use it, to plan the type and quantities of returned products, for other companies the returned products are much more difficult to predict. Even in those industries less predictable, managers must be prepared to the process and manage on-demand products quickly. In these situations, the exchanges should be precise and access to information and knowledge creation processes that enable the capture, storage, retrieval and dissemination of knowledge in organizing logistics become fundamental (Nonaka & Konno, 1998; Rogers & Tibben-Lembke, 1999). Therefore, greater use of the processes of knowledge creation in the organization becomes more proactive in the organization to reverse logistics (Kim, 1998). Reverse logistics proactivity is essential because the company currently operates in complex, changing and highly competitive environment (Lumpkin & Dess, 1996) and it expresses the attitude of anticipating the future act on gaps and on current and future needs, as should do the ongoing process of knowledge creation (Carrillo *et al.*, 2004), thus establishing the advantage over competitors by being the first act (Lumpkin & Dess, 1996). Since socialization enables businesses to direct and amplify their tacit knowledge to increase continuously collective learning (Nonaka & Takeuchi, 1995) and improve their stock of knowledge (Nonaka *et al.*, 2000), this allows the company to anticipate the current and future needs, which makes the existence of proactive attitude in the company that provides the advantage over competitors (Carrillo *et al.*, 2004, Lumpkin & Dess, 1996). For example, researchers and managers are socialized through direct coordination with the staff responsible for implementing the applications, there is a high feedback that drives a new and better knowledge that adds value to the organization (Nonaka & Konno, 1998) which increases continuously through coordination between the various parties (Blumberg, 1999).

We can summarize the above on how socialization is related to the proactive attitude of the organization of logistics in the following sentence: Socialization is positively related to proactivity towards reverse logistics of the organization.

Reverse logistics and flexibility of distribution of information

The more uncertainty means the more importance of the proper management of information (Kenne *et al.*,

2012). Flexibility of distribution of information is an important issue in logistics processes (Barad & Sapir, 2003) since it favors responding to customer needs (Bowersox *et al.*, 1999), it also reduces response times (Fawcett and Clinton, 1996; Fitzgerald *et al.*, 2009), supports a variety of delivery requirements (Sethi & Sethi, 1990) and reduces the costs of reverse logistics (Banomyong *et al.*, 2008), especially transport costs of central service returns, which are the higher costs of reverse logistics (Rogers & Tibben-Lembke, 2001), so it can be considered a fundamental capability to compete (Stalk *et al.*, 1992) that increases the value of the company's products obtained by processes reverse logistics.

Furthermore, the more important are the reverse logistics programs, the more necessary for the organization is to cope with the increasing uncertainty in these activities (Barad & Sapir, 2003). So similarly also it increases the need for flexibility of distribution of information to reduce this uncertainty (Koste & Malhotra, 1999; Swafford, 2003). In this sense, researches that attempt to relate reverse logistics and flexibility (Fawcett & Clinton, 1996; Sethi & Sethi, 1990; Swafford, 2003) focus on those logistics capabilities that enable the organization to improve its availability of options, by reducing uncertainty and improving decision-making, as in the case of flexible of material handling (Schonberger, 1986), and within it, on the flexibility of the distribution of information (Arias, 2003). That's precisely why knowledge has a key role as minimizer of the uncertainty (Arrow, 1962; Galbraith & Kazanjian, 1986), in the process of decision making and planning (Murdick & Munson, 1988) and therefore this knowledge in reverse logistics is managed through information systems that improve the data processing operations facilitating managers to make better decisions (Swafford, 2003) and reducing response times (Lau & Lee, 2000). Flexibility of distribution of information is essential in order to reduce this uncertainty because it refers to the ability of managing the flow of information in the manufacturing process and the return of products (Arias, 2003; Sethi & Sethi, 1990).

Therefore, we can say there is a relationship between the importance of reverse logistics and flexibility of information that can be summarized as the importance of reverse logistics is positively related to the flexibility of distribution of information

Also, proactivity towards reverse logistics is enabling some companies to get new benefits from increased differentiation to the consumer (Rogers & Tibben-Lembke, 1999). The more proactive the organization is toward reverse logistics, the greater the effects of flexibility of distribution of information on it, because the greater the degree of involvement in the organization, developing multiple skills of the workforce and the commitment to continue research efforts to improve operational processes reverse logistics (Chang *et al.*, 2005).

Therefore, we can say that there is a relationship between reverse logistics proactivity and flexibility of the information. To sum up, proactivity towards reverse logistics is positively related to the flexibility of distribution of information.

Reverse logistics, flexibility of distribution of information and organizational performance

Since performance measures are critical to manage the organization effectively (Griffis *et al.*, 2007), it is necessary to know the possible implications of the variables we have analyzed because they create competitive advantages in the performance of the organization.

Creation of knowledge is a fundamental skill that creates value for the organization (Carrillo *et al.*, 2004; Li *et al.*, 2009; Nonaka, 1994; Nonaka & Konno, 1998; Nonaka & Takeuchi, 1995; Nonaka & Toyama, 2003; Takeuchi & Nonaka, 1986). Within knowledge management, knowledge creation plays an important role as a source of sustainable competitive advantages for the organization (Li *et al.*, 2009; Stentoft & Halldorsson, 2002) and since we are analyzing its relationship with reverse logistics it is necessary to analyze how both variables are related to the activities of reverse logistics with the results of the company.

Given the growing importance of reverse logistics programs (Rogers & Tibben-Lembke, 1999) and since the introduction of reverse logistics programs supposes benefits or potential benefits to the organization, it is necessary to analyze how it affects the performance of it. With respect to the assessment of logistics performance there are numerous ways to measure it: through the degree of compliance with delivery times of the share of logistics costs in sales, the degree of rotation inventory, the number of orders that are fully addressed, the average cycle of the order, the half-cycle variability of the order, the number of items collected per person per hour, the number of weeks of supply, the average time of return, the number of sales lost by lack of stock and logistics costs per unit (Griffis *et al.*, 2007).

Therefore, we summarize the relationship between the importance of reverse logistics and performance of the organization saying that the importance of reverse logistics is positively related to organizational performance.

Furthermore, through reverse logistics activities the organization reaches a higher value that also depends on the proactivity of the organization in the logistics process (Kim, 1998; Rogers & Tibben-Lembke, 1999). Proactivity is an important element of individual effectiveness, team and organizational level so that the lack of proactivity occurs due to the failure to identify or take advantage of opportunities that will change things. Already, the research of Garcia *et al.*, (2007) set out the positive influence of technology proactivity on organizational performance, and the work of Chang *et al.* (2005) set out the incidence of proactivity on the results of the organization. This leads us to say that proactivity towards reverse logistics is positively related to organizational performance.

Flexibility is closely linked to success performance in turbulent environment (Fitzgerald *et al.*, 2009). Flexibility of distribution of information may be considered as one of the company's intangible assets (Kuo *et al.*, 2006), like it occurs with the knowledge (Nonaka & Takeuchi, 1995) and reverse logistics (Wadhwa & Madaan, 2007). Thus, organizations have begun to try to measure their intangible assets and have gained many benefits that could provide competitive advantage. Through these intangibles, the

companies are making to increase the value of products and services, or recover the economic value of those products out of use, but provided that this is done from knowledge expressed as information that affects the results across different time reduction, increased accuracy, and so on. In fact, its importance increases even more the greater is the need for information for the proper management of material flow returned (Bowersox *et al.*, 1999; Daugherty *et al.*, 2002). All this is reflected in the results of the organization.

Also the studies that analyze flexibility of distribution of information, and within this, the combined benefits of leanness and agility, is seen as the same helping to reduce time and cost in the reverse logistics program, and increase customer satisfaction. Therefore, these results have been widely used to measure company's performance when using reverse logistics systems (Daugherty *et al.*, 2002).

This leads us to propose that flexibility of distribution of information relates positively with the results of the company.

Conclusions

This theoretical research has analyzed how relationship among the four modes of knowledge creation affects the activities of reverse logistics. Thus, knowledge creation process implies the internalization of explicit knowledge and it improves the understanding of all members of organization about how products are returned to the company, improving the decision-making and diminishing the higher uncertainty of reverse logistics processes, it leads these activities are more efficient.

Furthermore, socialization continuously increases stock of knowledge; it allows the company to anticipate the

current and future needs, which makes the existence of proactive attitude in the company that provides the advantage over competitors.

Additionally, the interaction of knowledge and reverse logistics affects significantly flexibility, making it a key objective for organizations, since flexibility of distribution of information improves their competitiveness, supporting a variety of delivery requirements, reducing uncertainty and response times and also improving anticipation to the continuous changes characteristic of these activities.

This anticipation and proactivity towards reverse logistics positively affects flexibility enabling some companies to get new benefits from increased differentiation to the consumer, developing multiple skills of the workforce and the commitment to continue research efforts to improve operational processes reverse logistics

Besides, creation of knowledge is a fundamental skill to get a superior performance of the organization.

In addition, reverse logistics activities lead the organization to reach a higher effectiveness that also depends on the proactivity of the organization towards logistics process.

Finally, flexibility of distribution of information is closely linked to success performance in turbulent environment.

So organizations should take into account all these intangibles in order to improve their performance.

In short, this paper establishes the first theoretical approach of the relationship and effects of key elements of the organization: knowledge modes, reverse logistics, flexibility and performance.

A second part of this research will show the empirical contrast for the constructs analyzed.

References

- Antoncic, B., & Hisrich, R. D. (2001). Intrapreneurship: Construct Refinement and Cross-Cultural Validation. *Journal of Business Venturing*, 16 (5), 495-527. [http://dx.doi.org/10.1016/S0883-9026\(99\)00054-3](http://dx.doi.org/10.1016/S0883-9026(99)00054-3)
- Arias, D. (2003). Service Operations Strategy, Flexibility and Performance in Engineering Consulting Firms. *International Journal of Operations & Production Management*, 23 (11), 1401-1423. <http://dx.doi.org/10.1108/01443570310501907>
- Arlbjorn, J. S., & Halldorsson, A. (2002). Logistics Knowledge Creation: Reflections on Content, Context and Processes. *International Journal of Physical Distribution & Logistics Management*, 32 (½), 22-39. <http://dx.doi.org/10.1108/09600030210415289>
- Arrow, K. J. (1962). The Economic Implications of Learning by Doing. *Review of Economic Studies*, 29, 155-73. <http://dx.doi.org/10.2307/2295952>
- Banomyong, R., Veerakachen, V., & Supatn N. (2008). Implementing Leagility in Reverse Logistics Channels. *International Journal of Logistics: Research and Applications*, 11 (1), 31-47. <http://dx.doi.org/10.1080/13675560701403651>
- Barad, M., & Sapirb, D. E. (2003). Flexibility in Logistic Systems—Modeling and Performance Evaluation. *International Journal Production Economics*, 85, 155-170. [http://dx.doi.org/10.1016/S0925-5273\(03\)00107-5](http://dx.doi.org/10.1016/S0925-5273(03)00107-5)
- Bernardo, J. J., & Mohamed, A. (1992). The Measurement and use of Operational Flexibility in the Loading of Flexible Manufacturing Systems. *European Journal of Operational Research*, 60, 144-155. [http://dx.doi.org/10.1016/0377-2217\(92\)90089-R](http://dx.doi.org/10.1016/0377-2217(92)90089-R)
- Blumberg, D. F. (1999). Strategic Examination of Reverse Logistics and Repair Service Requirements, Needs, Market Size, and Opportunities. *Journal of Business Logistics*, 20 (2), 141-159.
- Bollen, K. A. (1989). *Structural Equations with Latent Variables*. Wiley-Interscience Publication, USA.
- Bowersox, D. J., Closs, D. J., & Stank, T. P. (1999). *21st Century Logistics: Making Supply Chain Integration a Reality*. Council of Logistics Management, Illinois: Oak Brook.

- Brancheau, J. C., Janz, B. D., Wetherbe, J. C. (1996). Key Issues in Information Systems Management: 1994-95 SIM Delphi results'. *MIS Quarterly*, 20 (2), 225-42. <http://dx.doi.org/10.2307/249479>
- Byrd, T. A., & Turner, D. E. (2000). Measuring the Flexibility of Information Technology Infrastructure: Exploratory Analysis of a Construct. *Journal of Management Information Systems*, 17 (1), 167-208.
- Carrillo, P., Robinson, H., AlGahssani, A., & Anumba, C. (2004). Knowledge Management in UK Constructions: Strategies, Resources, and Barriers. *Project Management Journal*, 35 (1), 46.
- Chang, S. C., Ru-Jen Lin, R. J., Chen, J. H., & Huang, L. H. (2005). Manufacturing Flexibility and Manufacturing Proactiveness: Empirical Evidence from the Motherboard Industry". *Industrial Management & Data Systems*, 105 (8), 1115-1132. <http://dx.doi.org/10.1108/02635570510624482>
- Chanopas, A., Donyaprueh, K., Khang, D. B. (2006). Managing Information Technology Infrastructure: a New Flexibility Framework. *Management Research News*, 29 (10), 632-651. <http://dx.doi.org/10.1108/01409170610712335>
- Christopher, M. (1994). *Logistics and Supply Chain Management*. Burr Ridge, IL: Irwin Professional.
- Daugherty, P., Matthew B. M., Richey, R. G. (2002). Information Support for Reverse Logistics: The influence of Relationship Commitment. *Journal of Business Logistics*, 23, 85-106. <http://dx.doi.org/10.1002/j.2158-1592.2002.tb00017.x>
- Dowlatshahi, S., (2000). Developing a theory of Reverse Logistics. *Interfaces*, 30 (3), 143-155. <http://dx.doi.org/10.1287/inte.30.3.143.11670>
- Fawcett, S. E., & Clinton, S. R. (1996). Enhancing loGistics Performance to Improve the Competitiveness of Manufacturing Organizations. *Production & Inventory Management Journal*, 1st Quarter, 40-46.
- Fitzgerald, G., Barad, M., Papazafeiropoulou, A., & Alaa, G. (2009). A Framework for Analyzing Flexibility of Generic Objects. *International Journal of Production Economics*, 122, 329–339. <http://dx.doi.org/10.1016/j.ijpe.2009.06.005>
- Dun & Bradstreet (2008). Database [online] <http://www.dnb.com/us/>
- Galbraith, J. R., & Kazanjian, R. J. (1986). *Strategy Implementation; Structure, Systems and Process*. California: West Publishing.
- Garcia, V. J., Ruiz-Moreno, A., & Llorens-Montes, F. J. (2007). Effects of Technology Absorptive Capacity and Technology Proactivity on Organizational Learning, Innovation and Performance: An Empirical Examination. *Technology Analysis & Strategic Management*, 19 (4), 527-558. <http://dx.doi.org/10.1080/09537320701403540>
- Griffis, S. E., Goldsby, T. J., Cooper, M., & Closs, D. J. (2007). Aligning Logistics Performance Measures to the Information needs of the Firm. *Journal of Business Logistic*, 28 (2), 35-53. <http://dx.doi.org/10.1002/j.2158-1592.2007.tb00057.x>
- Gupta, Y. P., & Somers, T. M. (1992). The Measurement of Manufacturing Flexibility. *European Journal of Operational Research*, 60, 166–182. [http://dx.doi.org/10.1016/0377-2217\(92\)90091-M](http://dx.doi.org/10.1016/0377-2217(92)90091-M)
- Hair, J. F., Anderson, R. E., Tatham, R. L., & Black, W. (2001). *Multivariate Data Analysis (5th ed)*. London: Prentice Hall Pearson Education.
- Henderson, R. M., & Clark, K. B. (1990). Architectural Innovation: The Reconfiguration of Existing Product Technologies and the Failure of Established Firms. *Administrative Science Quarterly*, 35, 9-30. <http://dx.doi.org/10.2307/2393549>
- Hitt, M. A., Keats, B. W., & Demarie, S. M. (1998). Navigating in the New Competitive Landscape: Building Strategic Flexibility and Competitive Advantage in the 21st Century. *The Academy of Management Executive*, 12 (4), 22-42.
- Kenne, J. P., Dejax, P., & Gharbi, A. (2012). Production Planning of a Hybrid ManufaCturing–Remanufacturing System under Uncertainty Within a Closed-Loop Supply Chain. *International Journal of Production Economics*, 135, 81–93. <http://dx.doi.org/10.1016/j.ijpe.2010.10.026>
- Kess, P., Haapasalo, H. (2002). Knowledge Creation Through a Project Review Process in Software Production. *International Journal of Production Economics*, 80, 49–55. [http://dx.doi.org/10.1016/S0925-5273\(02\)00242-6](http://dx.doi.org/10.1016/S0925-5273(02)00242-6)
- Ketzenberg, M. E., Van der Laan, E., & Teunter, R. H. (2004). *The Value of Information in Reverse Logistics*. Report Series Research in Management. Erasmus Research Institute of Management, Spring, 1-40.
- Kim, L. (1998). Crisis Construction and Organizational Learning: Capability Building in Catching-up at Hyundai Motor. *Organization Science*, 9 (4), 506-521. <http://dx.doi.org/10.1287/orsc.9.4.506>
- Kogut, B., & Zander, U. (2003). Knowledge of the Firm and the Evolutionary theory of the Multinational Corporation. *Journal of International Business Studies*, 34 (6), 516–529. <http://dx.doi.org/10.1057/palgrave.jibs.8400058>
- Konrad, A. M., & Linnehan, F. (1995). Formalized HRM Structures: Coordinating Equal Employment Opportunity or Concealing Organizational Practice? *Academy of Management Journal*, 38, 787-820. <http://dx.doi.org/10.2307/256746>
- Koste, L., Malhotra M. K. (1999). A Theoretical Framework for Analyzing the Dimensions of Manufacturing Flexibility. *Journal of Operations Management*, 18, 75-93. [http://dx.doi.org/10.1016/S0272-6963\(99\)00010-8](http://dx.doi.org/10.1016/S0272-6963(99)00010-8)

- Koufteros, X., Babbar, S., & Kaighobadi, M. (2009). A Paradigm for Examining Second-order Factor Models Employing Structural Equation Modeling. *International Journal of Production Economics*, 120 (2), 633-652. <http://dx.doi.org/10.1016/j.ijpe.2009.04.010>
- Kuo, H. C., Li, Y., Wang, L., & Ding, C. (2006). Flexibility and Performance of Mnes: Evidence From Taiwan. *International Journal of Business*, 11 (4), 417-432.
- Li, Y. H., Huang, J. W., & Tsai, M. T. (2009). Entrepreneurial Orientation and Firm Performance: The Role of Knowledge creation process. *Industrial Marketing Management*, 38, 440-449. <http://dx.doi.org/10.1016/j.indmarman.2008.02.004>
- Lumpkin, G. T., & Dess, G. G. (1996). Clarifying the Entrepreneurial Orientation Construct and Linking it to Performance. *Academy of Management Review*, 21(1), 135-172.
- Matusik, S. F., & Hill, C. W. L. (1998). The utilization of Contingent Work, Knowledge Creation, and Competitive Advantage. *Academy of Management Review*, 23 (4), 680-697. <http://dx.doi.org/10.2307/259057>
- Munoz, A., & Cordon, E., (2002). Tamano, Estructura e Innovacion Organizacional. *Revista Europea de Direccion y Economia de la Empresa*, 11 (3), 103-120.
- Murdick, R. G., & Munson, J. C. (1988). *Sistemas de Información Administrativa*. Mexico. Prentice Hall hispano Americana.
- Nonaka, I. (1994). A Dynamic Theory of Organizational Knowledge Creation. *Organization Science*, 5 (1), 14-37. <http://dx.doi.org/10.1287/orsc.5.1.14>
- Nonaka, I., & Konno, N. (1998). The Concept of Ba: Building a Foundation for Knowledge Creation. *California Management Review*, 40 (3), 40-54. <http://dx.doi.org/10.2307/41165942>
- Nonaka, I., & Takeuchi, H. (1995). *The Knowledge-Creating Company: How Japanese Companies Create the Dynamics of Innovation*. Oxford: Oxford University Press.
- Nonaka, I., & Toyama, R. (2003). The Knowledge-Creating Theory Revisited: Knowledge Creation as a Synthesizing Process. *Knowledge Management Research & Practice*, 1, 1, 2-10. <http://dx.doi.org/10.1057/palgrave.kmrp.8500001>
- Nonaka, I., Toyama, R., & Konno, N. (2000). SECI, Ba and Leadership: A Unified Model of Dynamic Knowledge creation. *Long Range Planning*, 33 (1), 5-34. [http://dx.doi.org/10.1016/S0024-6301\(99\)00115-6](http://dx.doi.org/10.1016/S0024-6301(99)00115-6)
- Nonaka, I., Byosiere, P., Borucki, C., & Konno, N. (1994). Organizational Knowledge Creation Theory: A First Comprehensive test. *International Business Review*, 3 (4), 337-351. [http://dx.doi.org/10.1016/0969-5931\(94\)90027-2](http://dx.doi.org/10.1016/0969-5931(94)90027-2)
- Podsakoff, P. M., & Organ, D. W. (1986). Self-Reports in Organization Research: Problems and Prospects. *Journal of Management*, 12, 531-544. <http://dx.doi.org/10.1177/014920638601200408>
- Rivero, S. (2002). *Claves y Pautas para Comprender e Implantar la Gestion del Conocimiento: un Modelo de Referencia*. Las Arenas. SOCINTEC.
- Robertson, B., & Sriabar, V. (2002). *The Adaptive Enterprise: IT Infrastructure Strategies to Manage Change and Enable Growth*. Oregon, Intel Press.
- Rogers, D. S., & Tibben-Lembke, R.S (1999). *Going Backwards: Reverse Logistics Trends and Practices*. Pittsburgh, PA. RLEC Press. <http://dx.doi.org/10.1002/j.2158-1592.2001.tb00007.x>
- Rogers, D.S., Tibben-Lembke, R.S., (2001). An Overview of Reverse Logistics Practices. *Journal of Business Logistics*, 22 (2), 129-149.
- Sanchez, R., & Mahoney, J. T. (1996). Modularity, Flexibility, and Knowledge Management in Product and Organization Design. *Strategic Management Journal*, 17, 63-76.
- Sethi, A. K., & Sethi, S. P. (1990). Flexibility in Manufacturing. *International Journal of Flexible manufacturing Systems*, 2 (4), 289-328. <http://dx.doi.org/10.1007/BF00186471>
- Stalk, G., Evans, P., & Shulman, L. E. (1992). Competing on Capabilities: the New Rules of Corporate Strategy. *Harvard Business Review*, 70 (2), 57-69.
- Standoff, J., & Halldorsson, A. (2002). Logistics Knowledge Creation: Reflections on Content, Context and Processes. *International Journal of Physical Distribution & Logistics Management*, 32 (½), 22-39.
- Swafford, P. (2003). *Theoretical Development and Empirical Investigation of Supply Chain Agility*. Georgia Institute of Technology.
- Takeuchi, H., & Nonaka, I. (1986). The New Product Development Game. *Harvard Business Review*, 64 (1), 137-146.
- Venkatraman, N., & Ramanujam, V. (1986). Measurement of Business Performance in Strategy Research: A Comparison of Approaches. *Academy of Management Review*, 11(4), 801-814.
- Wadhwa, S., & Madaan, J. (2004). *Role of Quality Management Self-Assessment Model to Promote Reverse Logistics Operations*. Bangkok: International Conventions on Quality Control Circles.
- Wadhwa, S., & Madaan, J. (2007). Conceptual Framework for Knowledge Management in Reverse Enterprise System. *Journal of Knowledge Management Practice*, 8 (2), 1-22.

Zack, M. (1999). Developing a Knowledge Strategy. *California Management Review*, 41 (3), 125-146.
<http://dx.doi.org/10.2307/41166000>

Antonio Mihi Ramirez, Lina Girdauskienė

Žinių ir žaliosios logistikos savitarpio santykis teoriniu požiūriu

Santrauka

Šiuolaikinėje ekonomikoje žinios tapo vienu iš svarbiausių nematerialiųjų organizacijos išteklių (Kess, Haapasalo 2002; Li ir kt., 2009; Nonaka, 1994). Organizacijos sėkmingai veiklai ypač reikšmingas yra žinių kūrimo procesas (Nonaka, 1994; Nonaka, Konno, 1998). Lygiai taip pat, *reverso logistikos* procesas didina organizacijos konkurencingumą (Kenné ir kt., 2012). *Reverso logistika* tiria produkto atgalinį judėjimą ir siekia suteikti informacijos, kaip suvaldyti galimas tokio proceso pasekmes, su kuriomis susiduria organizacija (Dowlatshahi, 2000; Rogers, Tibben-Lembke 1999, 2001; Tibben-Lembke, Rogers, 2002). Igyvendinant *Reverso logistikos* veiklas (prekės grąžinimo metu), yra būtinas žinių valdymas, nes reikia išspręsti įvairias išskylančias problemas (Wadhwa, Madaan, 2007). Taigi, organizacijoms yra svarbu gebėti kaupti naujausią informaciją, kartu mažinant *reverso logistikos* veiklų neapibrėžtumą (Arrow, 1962; Galbraith, Kazanjian, 1986) ir taip tampant lankstesnėmis. Taip siekiama didinti savo galimybes, kad būtų greičiau sureaguota į nuolatinius pokyčius, kurie atsiranda tų veiklų metu. Šiame straipsnyje yra siekiama išanalizuoti žinių kūrimo ir *reverso logistikos* tarpusavio ryšį ir galimą sąveiką, taip pat jų įtaką informacijos perdavimo lankstumui, nes informacijos valdymas *reverso logistikos* metu, leidžia pagerinti duomenų apdorojimo operacijas bei leidžia priimti geresnius sprendimus (Swafford, 2003).

Siekiant išanalizuoti žinių kūrimo procesą, šiame darbe remiamasi Nonaka ir Takeuchi (1995) žinių kūrimo modeliu, susidedančiu iš keturių etapų: socializacijos, eksternalizacijos, internalizacijos ir kombinavimo. Nustatytas tiriamas ryšys tarp šių etapų. Vėliau analizuojami žinių kūrimo etapai ir jų ryšys su *reverso logistika*. Taip pat yra vertinama žinių kūrimo proceso įtaka *reverso logistikai* ir jos operacijų lankstumui (Bernardo, Mohamed 1992), kai koncentruojamasi į informacijos perdavimo lankstumą, kuris apibūdinamas gebėjimu lengvai perduoti ir platinti informaciją bei galimybę tai daryti (Brancheau ir kt., 1996; Byrd, Turner, 2000; Chanop ir kt., 2006; Henderson, Clark, 1990; Robertson, Sribar, 2002; Sánchez, Mahoney, 1996; Takeuchi, Nonaka, 1986). Taip pat analizuojama kaip *reverso logistikos* procesas ir informacijos perdavimo lankstumas veikia efektyvią organizacijos veiklą (Griffis ir kt., 2007). Straipsnio struktūra: mokslinės literatūros analizė, numatytos hipotezės ir išvados.

Atliktas teorinis tyrimas leidžia patvirtinti Nonaka ir Takeuchi (1995) modelyje pateiktą artimą ryšį tarp skirtingų žinių fazių virsmų, kai yra teigiama, kad žinių kūrimas vyksta per slypinčių ir išreikštų žinių sąveiką, keturių žinių fazių virsmų metu. Siekiant iširti ryšį tarp žinių kūrimo ir *reverso logistikos*, buvo suformuluota nemažai hipotezių. Išanalizavus *reverso logistikos* veiklas, galima teigti, kad šių veiklų lankstumo užtikrinimas būtų esminis organizacijoms, norinčioms padidinti savo konkurencingumą, išlaikyti tiekimo reikalavimus, mažinti neapibrėžtumą ir numatyti *reverso logistikos* veiklų nuolatinių pokyčių charakteristikas.

Raktažodžiai: *reverso logistika, žinių kūrimas, informacijos tiekimo lankstumas, organizacijos veikla.*

The article has been reviewed.

Received in January, 2013; accepted in June, 2013.