The Influence of Managerial, Digital, Relational and Behavioural Skills on the Perception of Barriers and Drivers of Implementing Digital Intelligent and Sustainable Logistics

Submitted 12/05/22, 1st revision 23/06/22, 2nd revision 12/07/22, accepted 30/07/22

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Abstract:

Purpose: The purpose of the paper is to investigate the influence of different skills (managerial, digital, relational, behavioural) on the perception of barriers and drivers of implementing Digital Intelligent and Sustainable Logistics (DISL) in companies.

Design/Methodology/Approach: To determine the impact of the level of skills on the perception of barriers and drivers of implementation of DISL, a survey was carried out among randomly selected logistics and production companies operating in Poland. Further, to test the research model and proposed hypothesis, this study applies Partial Least Squares Path Modelling (PLS), a variance-based structural equation modelling technique (SEM).

Findings: The results of the conducted research allow us to conclude that there is a statistically significant relationship between the identified level of skills in a company and the perception of the significance level of barriers and drivers of DISL implementation (higher level of behavioural skills causes a stronger perception of barriers and drivers).

Practical Implications: The findings can be used in decision making process on developing different skills in order to improve the perception of barriers and drivers and further support the implementation of DISL related solution in companies.

Originality/Value: The paper contributes to the newest trends in literature on supply chain management (covering digitalization and smart and sustainable logistics) and specifically highlights the relation of skills with barriers and drivers on the implementation of DISL.

Keywords: Skills, barriers, drivers, Digital Intelligent and Sustainable Logistics (DISL), PLS.

JEL codes: J24, R40, M10, M11, M12.

Paper Type: Research paper.

Acknowledgement: The research presented in this paper was performed as a result of the NEXTLOG project (supported by the EU Erasmus + Programme 2019-1-PL01-KA203-065731).

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1. Introduction

In recent years the logistics market experienced rapid development and has been subject to substantive pressures and changes. Digital transformation of supply chains (Burroughs and Burroughs, 2020), rising complexity of transportation routes, uncertainties in collection and delivery times (Sanchez-Rodrigues et al., 2010), growing interest in Industry 4.0, specifically autonomous logistics, self-organising logistics, intelligent transportation systems, intelligent integration of external and internal transportation, deep learning approach towards inventory optimisation and demand forecasting processes (Fan et al., 2020; Ren et al., 2020) emerged into intelligent (smart) supply chains (Liu et al., 2021).

Furthermore, due to resource scarcity (Genovese et al., 2017), the companies were looking for "green" solutions to integrate with their supply chains (Kersten et al., 2017). With the observed changes, the global supply chains are currently rapidly progressing towards digital, intelligent and sustainable logistics (DISL). DISL is necessary to increase safety, tackle growing emissions and congestion problems, make processes within supply chains more efficient and sustainable, and enable the proper integration of today's society in the next-generation Industry 4.0 context.

Nevertheless, to successfully implement any concept, a specific skillset is required (Derwik et al., 2016; Shou and Wang, 2017) and within the conducted research, we analysed next-generation competencies of logistics and supply chain managers that would be required to implement DISL. The purpose of the paper is to investigate the influence of different skills (managerial, digital, relational, behavioural) on the perception of barriers and drivers of implementing DISL in companies.

2. Literature Review

The purpose of the article entailed the necessity of adopting an input set of skills subsequently verified in the research process. The set of supply chain competencies presented by Derwik and Hellström (2017) was taken as a starting point – it includes functional, relational, managerial and behavioural skills. We decided to modify the framework regarding functional skills. In the developed model, they were replaced with digital skills, which have become extremely important in organizations in recent years (especially during the pandemic). It is justified, as functional skills in Derwik and Hellström's model, include technique and technology knowledge related to digital skills. Moreover, the broad approach to the study area (DISL), focuses our attention on the universal skills of managers in logistics sector, regardless of the functional area of the supply chain.

Digital skills are intrinsically linked to DISL and relate to the use of the opportunities offered by modern information technology tools. As digital technologies radically change the conditions of supply chain management, skills in mastering and leveraging them are becoming critical for modern organizations
Managers should be aware of this as they play a crucial role in driving the development of digital competencies in companies (Bi et al., 2018). Digital skills are, on the one hand, related to data processing in order to obtain added value (Murawski and Bick, 2017) and, on the other hand, enable efficient communication and cooperation in a networked environment (García-Sánchez et al., 2018). A detailed list of digital skills is presented in Table 1.

Table 1. Digital skills – DISL perspective

| No. | Types of digital skills                        | Source                                      |
|-----|-----------------------------------------------|---------------------------------------------|
| 1.  | Information processing                        | Bouri et al., 2018;                        |
| 2.  | Network and information security              | Hecklau et al., 2016;                      |
| 3.  | Digital communication                         | Hummel et al., 2015;                       |
| 4.  | Digital collaboration                         | Kohl et al., 2019;                         |
| 5.  | eLearning                                     | Morgan et al., 2016                        |

Source: Own study.

Managers operating in DISL face many challenges due to the dynamics of the environment. In challenging environments, they must set goals, develop and implement long-term strategies (Sohal, 2013; Dotson et al., 2015; Gammelgaard and Larson, 2001) while focusing on the operational level (Thai and Yeo, 2015). Among the managerial skills listed in Table 2, it is worth highlighting risk handling (Ellinger et al., 2015) and the ability to acquire the appropriate people, technology, equipment and financial resources to meet customer expectations. These skills are of particular importance in DISL implementation, as they allow for the exploitation of emerging opportunities.

Table 2. Managerial skills – DISL perspective

| No. | Types of managerial skills                        | Source                                      |
|-----|--------------------------------------------------|---------------------------------------------|
| 1.  | Ability to develop and lead strategic business planning | Jayant et al., 2014;                        |
| 2.  | Ability to manage cost-effectiveness of supply chain | Paulraj, 2011;                              |
| 3.  | Ability to develop and lead business transformation process | Ying et al., 2015                           |
| 4.  | Ability to implement quality standards and initiatives |                                            |
| 5.  | Ability to lead risk assessment and management    |                                            |
| 6.  | Ability to recognize, analyze, and solve a variety of problems |  |
| 7.  | Ability to use KPIs for teams or supply chain management |                                            |
| 8.  | Ability to supervise SC processes                |                                            |
| 9.  | Ability to acquire the appropriate people, technology, equipment and financial resources to meet customer expectations | |
| 10. | Ability to understand financial statements       |                                            |

Source: Own study.

Relational skills listed in Table 3 are the next area of importance for DISL. Proper communication within and outside the organization is key to sharing knowledge (Halley et al., 2006) and understanding company goals and challenges. Intelligent and sustainable development requires cultural and cross-functional awareness that
comes from relational skills (Prajogo and Sohal, 2013; Sohal, 2013). Addressing challenges and completing major projects often becomes facilitated through market collaboration which also has an impact on increase in economic performance (Caputo et al., 2019).

Table 3. Relational skills – DISL perspective

| No. | Types of relational skills                                           | Source                                  |
|-----|----------------------------------------------------------------------|-----------------------------------------|
| 1.  | Ability to communicate effectively within an organization           | Cao et al., 2009;                       |
| 2.  | Ability to communicate effectively with vendors/suppliers           | Cvetić et al., 2017;                    |
| 3.  | Ability to collaborate with cross-functional personnel              | Gámez-Pérez et al., 2020;               |
| 4.  | Ability to effectively work in teams and in matrix organisation structure | Heaslip et al., 2019; Vaičiūtė et al., 2017 |
| 5.  | Ability to share knowledge between departments                       |                                        |

Source: Own study.

The last group described concerns the most individual - behavioral skills, identified as fundamental aspects of the modern supply chain (Derwik and Hellström, 2021). Skills such as time management, integrity, confidence, multitasking, and stress-resistance (Okongwu, 2007; Thai, 2012) characterize good managers, coping under all conditions. Creative, innovative thinking and problem-solving ability (Saha and Sharma, 2020) are skills that foster recognizing threats and turning them into opportunities. A summary of behavioral skills is presented in Table 4.

Table 4. Behavioural skills – DISL perspective

| No. | Types of behavioural skills                                       | Source                                  |
|-----|-------------------------------------------------------------------|-----------------------------------------|
| 1.  | Ability to embrace innovative and creative thinking              | Cao et al., 2009;                       |
| 2.  | Self-driven; taking initiative; work without supervision         | Chhetri et al., 2018;                   |
| 3.  | Ability to think strategically                                   | Heaslip et al., 2019;                   |
| 4.  | Willingness to experiment with new digital technology             | Jäger et al., 2014;                    |
| 5.  | Ability to present oneself with confidence                       | Ližbetinová, 2017;                     |
| 6.  | Ability to empathize with others                                 |                                        |
| 7.  | Ability to handle job-related stress                             |                                        |

Source: Own study.

The level of the above skills determines how managers operate within the organization. Specialization within particular skills can lead to specific perceptions of business direction, including DISL. The implementation of DISL solutions, depends on various factors that can be antagonized as barriers and drivers. The key ones identified by Kalinowski et al. (in press) are presented in Table 5.

The considerations of the relationship between skill sets and the ability to perceive the mentioned determinants of DISL implementation were addressed in the following research questions:
**RQ1:** Does the level of skills in a company influence the perception of the significance level of barriers and inhibitors of DISL solutions implementation?

**RQ2:** Which skills are most important for the perception of the significance level of barriers and drivers of DISL implementation in companies?

### Table 5. Barriers and drivers set of DISL implementation to companies

| Barrier                                                                 | Drivers                                               |
|------------------------------------------------------------------------|-------------------------------------------------------|
| 1. Implementation cost                                                 | 1. Pressure from the local community                  |
| 2. Lack of intellectual capital                                         | 2. Pressure from shareholders / investors              |
| 3. No technological support                                             | 3. More stringent regulations and legal conditions     |
| 4. Time needed to implement DISL                                        | 4. Global environmental challenges                     |
| 5. Poor commitment of the top management                                | 5. Market pressure from local customers                |
| 6. Insufficient market pressure                                          | 6. Market pressure from international customers        |
| 7. Resistance of employees to changes                                   | 7. The potential of digital transformation             |
| 8. Lack of standardization in the implementation of DISL solutions      | 8. Financial pressure to reduce costs                  |
| 9. No short-term benefits                                               | 9. Improving the business benefits of the organization|
| 10. There is no single framework to regulate implementation              | 10. Increased competition                              |
|                                                                        | 11. More effective tracking and timely delivery        |

*Source: Own study.*

### 3. Research Methodology

To determine the impact of the level of skills on the perception of barriers and drivers of implementation of DISL, a survey was carried out among randomly selected logistics and production companies operating in Poland. It was requested that the questionnaire be answered by the company representative responsible for logistics and/or supply chain management, i.e., CEO - Chief Executive Officer - 14% of responders, Chief Management Officer (CMO) - 18% of responders, middle management level (i.e., branch and department heads) - 50% of responders and others responsible for logistics affairs - 18% of responders.

Most of the respondents were over 26 (98%), including 26-35 years old - 30% of the respondents, 36-50 years old - 50%, 51-65 years old - 18%. All representatives of enterprises participating in the study had at least higher education and 6% of them had a doctoral degree. Participants were assured of absolute confidentiality and anonymity. A total of 50 valid questionnaires were collected between December 2020 and February 2021.

The survey questionnaire was developed based on the results of the conducted literature research. It was built in two parts. The first one contained questions about the barriers and drivers of DISL implementation. The second part concerned the self-assessment of the level of skills (managerial, digital, relational, behavioural) held by
the company. The respondents assessed the significance of the barrier or driver and the levels of skills on a seven-point Likert scale, where 1 meant low significance/no skill, and 7 - high significance/high level of skill.

4. Survey Study

To test the research model and proposed hypothesis, this study applies Partial Least Squares Path Modelling (PLS), a variance-based structural equation modelling technique (SEM) that aims to maximise the explained variance of the dependent latent constructs (Hair et al., 2017). SmartPLS version 3 was used to analyze the data in this study following a two-step analysis approach. Due to the characteristics of the studied variables, it was necessary to check them for internal consistency, indicator reliability, convergent validity, and discriminant validity. Composite reliability (CR), Cronbach's alpha (α), and Dijkstra-Henseler's rho (rho_A) were used to measure construct reliability. Heterotrait- monotrait-HTMT criteria were used to assess discriminant validity. Construct reliability and validity assessment is presented in Table 6.

Table 6. Construct reliability and validity.

| Constructs        | Cronbach's Alpha | rho_A | Composite Reliability | Average Variance Extracted (AVE) |
|-------------------|------------------|-------|-----------------------|----------------------------------|
| Barriers          | 0.768            | 0.818 | 0.848                 | 0.584                            |
| Behavioural skills | 0.903            | 0.925 | 0.921                 | 0.628                            |
| Digital skills    | 0.888            | 0.911 | 0.915                 | 0.684                            |
| Drivers           | 0.852            | 0.871 | 0.894                 | 0.628                            |
| Managerial skills | 0.923            | 0.932 | 0.938                 | 0.685                            |
| Relational skills | 0.883            | 0.914 | 0.913                 | 0.678                            |

Source: Own study.

When evaluating construct reliability and validity, it should be noted that the Cronbach's Alpha value for each construct is greater than 0.7 (Hair et al., 2017). It can be argued that the results demonstrate internal consistency reliability. The average variance extracted (AVE) is above the recommended threshold of 0.5 (Hair et al., 2017), demonstrating an acceptable level of convergent validity. HTMT for discriminant validity assessment is presented in Table 7.

Table 7. HTMT for discriminant validity

| Constructs        | Barriers | Behavioural skills | Digital skills | Drivers | Managerial skills |
|-------------------|----------|-------------------|----------------|---------|-------------------|
| Behavioural skills | 0.370    |                   |                |         |                   |
| Digital skills    | 0.202    | 0.829             |                |         |                   |
| Drivers           | 0.408    | 0.530             | 0.397          |         |                   |
| Managerial skills | 0.176    | 0.735             | 0.743          | 0.418   |                   |
| Relational skills | 0.378    | 0.785             | 0.593          | 0.441   | 0.754             |

Source: Own study.
The Heterotrait-monotrait (HTMT) ratio of correlations is smaller than the suggested threshold of 0.85 for all constructs (Henseler et al., 2015). To conclude, the measurement model has been correctly assessed.

Before proceeding with the assessment of the structural model, the coefficient of determination $R^2$ was calculated for each endogenous latent variable. This coefficient determines the predictive power of the model and must be greater than 0.1 (Falk and Miller, 1992). $R^2$ values for the developed model were, for Barriers - 0.246 and for Drivers - 0.251. Results of the significance tests for the path coefficients of the structural model are presented in Table 8.

| Constructs        | Barriers | p       | Drivers | p       |
|-------------------|----------|---------|---------|---------|
| Behavioural skills | 0.545    | 0.032*  | 0.407   | 0.072** |
| Digital skills    | -0.454   | 0.048*  | -0.033  | 0.402   |
| Managerial skills | -0.096   | 0.334   | 0.092   | 0.347   |
| Relational skills | 0.249    | 0.142   | 0.064   | 0.448   |

Notes: *significant at the 0.05 level; ** significant at the 0.1 level.
Source: Own study.

5. Conclusions and Future Research

The results of the conducted research allow us to conclude that there is a statistically significant relationship between the identified level of skills in a company and the perception of the significance level of barriers and drivers of DISL solutions implementation. The results show that a higher level of behavioural skills causes a stronger perception of both barriers and drivers. The explanation for this phenomenon should be sought in the characteristics of employees characterized by a higher level of behavioral skills (Saha and Sharma, 2020). These are usually people with a holistic view (not only on the implementation of DISL). They can combine more facts and define wider fields of influence.

Hence the assessment of the significance of barriers and drivers in these organizations is higher. On the other hand, a higher level of digital skills results in a weaker perception of the barriers to implementing DISL solutions. This clearly shows that knowledge of DISL solutions (e.g., IT related) results in fewer barriers.

The presented research has limitations in two dimensions: a questionnaire study (mainly a research sample) and an analysis of the results. The survey was conducted only among enterprises operating on the Polish market. Their number cannot be considered representative either. In the analysis of the results, no inference was made using mediation. Subsequently, the team of authors intends to expand the research model with mediation. Searching for dependencies using mediation allows for the extension of the research perspective and the analysis of much more complex
relationships between the level of competencies in the company and the perception of barriers and drivers of implementing DISL solutions.

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