

Understanding Women's Employment in the Logistics and Supply Chain Management Sector: Evidence from Indonesia

Irayanti Adriant*

Telkom University, Faculty of Economics and Business, Bandung, Indonesia

Email: irayantiadriant@telkomuniversity.ac.id

Abstract

Purpose – This study aims to identify the factors influencing women's participation in Indonesia's logistics workforce. It addresses persistent gender inequality in transportation and warehousing, where women represent less than 15% of workers despite digital transformation reducing the sector's dependence on physical strength.

Methodology – A qualitative approach was employed using semi-structured interviews with members of Indonesian Women in Transport & Logistics (IWTL), a professional community of women working in the logistics sector. The interview data were analysed through a coding process to identify recurring themes and construct relationships among the factors influencing women's employment participation.

Findings – The findings indicate that women's participation in the logistics sector is influenced by physical conditions, societal stereotypes, income, leadership opportunities, career pathways, work-life balance and marital status, professional networks, innovation, and educational attainment. These factors are interconnected and collectively shape women's decisions to enter, remain in, and develop their careers within the logistics industry. The results suggest that barriers to women's participation are not limited to physical job requirements but also involve organisational practices, social perceptions, career structures, and access to professional support.

Value – This research provides a gender-focused perspective on employment participation in Indonesia's logistics sector by drawing on the experiences of women logistics professionals. The findings contribute to the understanding of gender inequality in traditionally male-dominated industries and provide practical insights for companies, professional communities, and policymakers seeking to create more inclusive workplaces, improve women's career opportunities, and support gender equality in the logistics workforce.

Keywords: Gender equality, Women's work Participation, Logistics and Supply Chain Industry.

1. Introduction

Humans are divided into women and men, then social constructs form gender (U. Hasanah & Musyafak, 2018). Furthermore, Hasanah and Musyafak describe gender as a role for each sex that build by the time being along with the society. After the World War II, the shift and development about stereotype gender occur (Bobbitt-Zeher, 2011) raises the issue of discrimination and gender inequality. According to Amir and Suhartini (2013) gender equality is an equality of access, participation, control, and benefit in all the activity at all levels of live..(Amir & Suhartini, 2013). Gender Equality have a positive impact with the economic growth (World Bank, 2012) and have a high relevance with education and the labor market (Ministry of Woman Empowerment and child Protection, 2016). Gender Inequality Index (GII) is a global indicator measured gender inequality through the dimensions of reproductive health, empowerment, and the labor market. Klasen and Lamanna (2009) state the decline of gender inequality in education which is not followed with the equality of job opportunity will not deliver significant gains on economic growth. (Klasen & Lamanna, 2009).

The gender gap is related to poverty, negatively correlated to gross income, competitiveness, and having its peaks in countries with high unemployment and undeveloped welfare systems (Castellano & Rocca, 2018). Indonesia is one of the countries where the workforce is dominated by men. Indonesia ranks ninth out of ten ASEAN countries with the lowest level of difference between the participation of women and men (United Nations Development Programme., 2020). According to Central Agency on Statistics in 2021 the difference between participation of women and men in workforce is 28% dominated by men. However, there has been an increase in women's participation in economic and political life in Indonesia. Further review of 17 fields of work in Indonesia shows inequality in the participation of the Indonesian workforce, one of which occurs in the logistics sector, represented by transportation and warehousing at 13% dominated by men. The logistics sector is often described as a field that focuses on physical strength and is dangerous so that it is seen as unfriendly to women and difficult for women to rise to leadership positions (Zinn et al., 2018). The industrial revolution drives the development and digital transformation of logistics activities (Raza et al., 2020). Automation, Internet of Things (IoT) and integrated systems are dissolving logistics and physical strength. The condition of female workers in logistics in Indonesia below 15% (Fadil, 2018). This condition reflects that there are still factors affecting women's participation in logistics. Women can increase their control and participation in life through organizations (Meltem & Onur, 2019). Indonesian Women in Transport & Logistics (IWTL) is a women's organization in Indonesia engaged in logistics.

This research aim is to analyze the factors that influence women's participation in the logistics sector through the perspective of women logistics professionals and experts in Indonesia. Factor identification is followed up by

describing and compiling the relationships between factors to become the focus of research. The next section or part two will outline a brief theoretical basis relating to gender, logistics and interpretative structural modeling. The third section will explain the research method used, while sections 4, 5, and 6 will show the results of processing, discussion of the interpretation of the results of interpretive structural modeling and conclusions.

2. Literature Review

2.1 Gender

Term "Gender" began to be used sociologically in the 1970s. Gender is a characteristic of psychology, social, culture, and behavior or cultural interpretations related to gender (Salem Press, 2011). Gender is a socially generated difference between being feminist and masculine (Holmes, 2007). The notion of gender is socially constructed (Rose, 2011). While sex refers to biological conditions and determines one's biological fate. Sex is absolute and can be a boundary between women and men based on biological conditions except for special conditions or abnormalities such as ambiguous genetics (multiple sexes). While gender dynamic, depends on the norms, beliefs, and habits of the society that forms it. The gender stereotypes that are formed are widespread to cause several gender issues. Gender roles and gender position are some of the gender issues experienced by women and men (Fakih, 2006). In other words, stereotypes that are developed and used in society are the forerunners of gender inequality. Women are positioned in an inferior position (Ramdhan, 2015) which ultimately limits the opportunities for women to be able to actualize themselves. Several forms of gender discrimination are marginalization, subordination, and workload (Fakih, 2006). Gender equality can be realized if all parts related to women can recognize and guarantee the liberation of all types of violence against women and guarantee women's investment and satisfaction (Meltem & Onur, 2019). Women able to increase control over their lives through making choices. (Meltem & Onur, 2019).

2.2 Logistics

Term "Logistik" has two language roots originate from French, "Logistique" and "Loger" (Paksoy et al., 2020). "Logistique" refers to military ranks and military support organizations while "Loger" refers to spatial military organizations. The term "Logistics" was then used by the United States Army to refer to meeting military needs. The term "Logistics" began to be used in the civil sector in 1960 (Paksoy et al., 2020). Logistics as a function is responsible for the flow of materials from suppliers to organizations and customers through a series of operational processes (Waters, 2003). Logistics is a series of processes to move materials from points of origin to points of consumption by considering the needs and desires of customers. The main characteristics are connectivity, movement and storage. Logistics plays an important role at the macro and micro economic level (Murphy Jr & Knemeyer, 2018). At the macro level, logistics plays a role in the growth and development of the national economy. At the micro level, logistics can affect consumers individually because logistics provides utility for time and place (Bowersox, 2003). Paksoy, et al (2020) classifies four eras of global logistics development in Logistics 1.0, 2.0, 3.0, 4.0. Logistics management is an integrated system that connects a series of processes within the organization in preparing and delivering products to end consumers. Activities in logistics management include production planning, distribution management, warehouse management, procurement and purchasing management, inventory management, customer relations.

2.3 Interpretative Structural Modelling (ISM)

ISM is a method use to have better understand the concepts they believe and to realize what is unknown (Attri et al., 2013). ISM does not add information, the ISM process only clarifies and redefines the system. ISM is used to solve complex problems with systematic and logical thinking (Ravi et al., 2005). On complex issues, ISM considers various factors related to issues or problems (Attri et al., 2013). The basic concepts of ISM are transitivity and reachability (Raj et al., 2008). Transitivity is a basic assumption of ISM and has always been used in the approach (Sage, 1977; Sharma et al., 1995; Watson, 1978) and the Reachability Concept is a building block of the ISM methodology. The elements that have been identified are compared based on their interrelationships. This information is represented in

the form of a binary matrix. ISM can be used on systems with a high level of abstraction. The number of variables or elements considered will affect the complexity of the ISM.

Attri et al (2013), formulated several steps taken in the ISM modeling, namely:

a. Step 1: Structural Self-Interaction Matrix (SSIM)

Identify the conceptual relationship between factors based on 'leads to' or 'influences'. With this basis, a contextual relationship between the identified factors is developed. A further conceptual relationship is established with the two factors i and j. There are four symbols used to describe the direction of the relationship between I and j, namely:

- 1) V describes the relationship where factor i influences factor j.
- 2) A describes the relationship where factor i is influenced by factor j.
- 3) X describes the relationship i and j influence each other.
- 4) O describes no relationship between i and j.

b. Step 2: Reachability Matrix

The development of SSIM into a Reachability Matrix is done by converting the SSIM symbols (V, A, X, O). The rule of substitution is:

- 1) The symbol V has a value conversion (i, j) worth 1 and (j, i) worth 0.
- 2) Symbol A has a value conversion (i, j) worth 0 and (j, i) worth 1.
- 3) Symbol X has a value conversion (i, j) worth 1 and (j, i) worth 1.
- 4) Symbol O has a value conversion (i, j) worth 0 and (j, i) worth 0.

c. Step 3: Level Partitions

Advanced development of the Reachability Matrix.

d. Step 4: Conical matrix

The Conical Matrix is the result of the development of grouping factors at an equivalent level across rows and columns in Reachability. The influence of a factor can be obtained by adding up the number in the row and the strength of its dependence by adding up the amount in the column (Attri,2013). Furthermore, the influence and dependency ratings are calculated by giving the highest rating to the factors that have the maximum number of factors in rows and columns.

e. Step 5: Digraphs

Based on Reachability Matrix and Conical Matrix graphs are built. Graphs are used as a visual representation.

f. Step 6: Interpretative Structural Modeling (ISM) Model

The graph is then converted into the ISM Model by changing the factor nodes with statements.

The ISM model is then followed up with a Matrice d'Impacts Croises-Multiplication Appliqué an Classment (MICMAC) analysis. The aim of the MICMAC Analysis is to analyze the drivers and dependencies. The principle of MICMAC is based on the nature of matrix multiplication. Based on the driving factors and their dependencies, there are four classifications, namely Autonomous Factors, Linkage Factors, Dependent Factors, and Independent Factors. Autonomous Factors, has weak characteristics as a factor that is categorized as weak in terms of being influenced and influencing. Linkage Factors have strong characteristics as factors that can be categorized, namely in terms of being influenced and influencing. Dependent Factors have a low driving force with a high dependency. Independent Factors have a high driving force with a low level of dependency. Factors with high driving force are referred to as key factors and can be included in the category of Independent Factors or Linkage Factors.

3. Research Methods

This research uses a qualitative methodology with the aim of describing the factors that influence women's participation in logistics and the relationship between factors. Qualitative research is inductive or bottom up in nature

where specific observations are made to redefine or reconstruct the phenomenon. The data used was obtained through semi-structured interviews which were selected based on a purposive sampling technique. Purposive sampling is a technique that determines the sample (informant) based on certain considerations (Sugiyono, 2017). Through the interviews, a comprehensive understanding of the factors and relationship between factors was obtained. The information obtained then analyzed using the Interpretive Structural Modeling (ISM) approach to analyze and construct the relationships between variables through interactive assessments from experts (Adriant et al., 2021).

4. Result and Discussion

4.1 Interpretive Structural Modeling

Interpretive Structural Modelling follows several activities:

a. Identify the Influencing Factors

Based on the literature review and observation nine influencing factors were identified influencing women's work participation in logistics shown in Table 1.

Tabel 1. Factor Identification

No	Description	Reference/Observe
1	Physical Condition	Amir & Suhartini, 2013
2	Community Stereotypes	Amir & Suhartini, 2013
3	Income	Tzannatos, 1999; Yıldırım et.al., 2019; Zinn et.al., 2018; M. Hasanah et.al., 2019; Pereira & Salaris, 2019
4	Leadership	Zuraik et.al., 2020
5	Career Path	Tzannatos, 1999; Pereira & Salaris, 2019
6	<i>Work Life Balance/Status</i>	Tzannatos, 1999; Yıldırım et.al., 2019; Zinn et.al., 2018; Wandaweka & Purwanti, 2021
7	Networking	Zinn et.al., 2018
8	Innovation	Gligor et.al., 2022
9	Level of Education	Yıldırım et.al., 2019; M. Hasanah et.al., 2019; Wandaweka & Purwanti, 2021

b. Build Structural Self-Interaction Matrix (SSIM)

Structural Self-Interaction Matrix (SSIM) describe the contextual relationship between the identified factors. Based on the interview result, The SSIM shows in Table 2.

Tabel 2. Structural Self-Interaction Matrix (SSIM)

No	Description	No								
		1	2	3	4	5	6	7	8	9
1	Physical Condition	X	V	V	O	V	A	O	V	O
2	Community Stereotypes	A	X	V	O	V	O	O	O	O
3	Income	A	A	X	A	A	A	A	V	A
4	Leadership	O	O	V	X	A	A	A	V	A
5	Career Path	A	A	V	V	X	X	X	V	A
6	<i>Work Life Balance/Status</i>	V	O	V	V	X	X	O	V	O
7	Networking	O	O	V	V	X	O	X	V	X
8	Innovation	A	O	A	A	A	A	A	X	A
9	Level of Education	O	O	V	V	V	O	X	V	X

c. Build Reachability Matrix

Convert the Structural Self-Interaction Matrix (SSIM) value (V, A, X, O) to a binary value of 1 or 0. The Reachability Matrix shows in Table 3.

Tabel 3. Reachability Matrix

No	Deskripsi	No							
		1	2	3	4	5	6	7	8
1	Physical Condition	1	1		0		0	0	1
2	Community Stereotypes	0	1	1	0	1	0	0	0
3	Income	0	0		0	0	0	0	1
4	Leadership	0	0	1	1	0	0	0	1
5	Career Path	0	0		1		1		1
6	Work Life Balance/Status	1	0	1	1	1	1	0	1
7	Networking	0	0		1		0		1
8	Innovation	0	0	0	0	0	0	0	1
9	Level of Education	0	0		1		0		1

d. Develop Level Partitions

Development of Level Partition table by determining the level for each variable based on the level of influence. Iteration I

Table 4 Level Partitions, Iteration I

No	Reachability Set	Antecedent set	Intersection	Level
1	1, 2, 3, 5, 8	1, 6	1	I
2	2, 3, 5	1, 2	2	
3	3, 8	1, 2, 3, 4, 5, 6, 7, 9	3	
4	3, 4, 8	4, 5, 6, 7, 9	4	
5	3, 4, 5, 6, 7, 8	1, 2, 5, 6, 7, 9	5, 6, 7	
6	1, 3, 4, 5, 6, 8	5, 6	5, 6	
7	3, 4, 5, 7, 8, 9	5, 7, 9	5, 7, 9	
8	8	1, 3, 4, 5, 6, 7, 8, 9	8	
9	3, 4, 5, 7, 8, 9	7, 9	7, 9	

Based on the table, found out that factor 8 has the same value of Reachability Set and Intersection with that result factor 8 become the Top-Level and will remove for the next iteration.

Iteration II

Table 5. Level Partitions, Iteration II

No	Reachability Set	Antecedent set	Intersection	Level
1	1, 2, 3, 5	1, 6	1	II
2	2, 3, 5	1, 2	2	
3	3	1, 2, 3, 4, 5, 6, 7, 9	3	
4	3, 4	4, 5, 6, 7, 9	4	
5	3, 4, 5, 6, 7	1, 2, 5, 6, 7, 9	5, 6, 7	
6	1, 3, 4, 5, 6	5, 6	5, 6	
7	3, 4, 5, 7, 9	5, 7, 9	5, 7, 9	
9	3, 4, 5, 7, 9	7, 9	7, 9	

Iteration III

Table 6. Level Partitions, Iteration III

N o	Reachabili ty Set	Antecedent set	Intersect ion	Le vel
1	1, 2, 5	1, 6	1	III
2	2, 5	1, 2	2	
4	4	4, 5, 6, 7, 9	4	
5	4, 5, 6, 7	1, 2, 5, 6, 7, 9	5, 6, 7	
6	1, 4, 5, 6	5, 6	5, 6	
7	4, 5, 7, 9	5, 7, 9	5, 7, 9	
9	4, 5, 7, 9	7, 9	7, 9	

Iteration IV

Table 7. Level Partitions, Iteration IV

No	Reachability Set	Antecedent set	Intersection	Level
1	1, 2, 5	1, 6	1	IV
2	2, 5	1, 2	2	
5	5, 6, 7	1, 2, 5, 6, 7, 9	5, 6, 7	
6	1, 5, 6	5, 6	5, 6	
7	5, 7, 9	5, 7, 9	5, 7, 9	
9	5, 7, 9	7, 9	7, 9	

Iteration V

Table 8. Level Partitions, Iteration V

N o	Reachabil ity Set	Antecede nt set	Inters ection	Level
1	1, 2	1, 6	1	V
2	2	1, 2	2	
6	1, 6	6	6	
9	9	9	9	

Iteration VI

Table 9. Level Partitions, Iteration VI

N o	Reachabil ity Set	Antecede nt set	Intersec tion	Le vel
1	1	1, 6	1	VI
6	1, 6	6	6	

Iteration VII

Table 10. Level Partitions, Iteration VII

No	Reachability Set	Antecedent set	Intersection	Level
6	6	6	6	VII

e. Develop *Conical Matrix*

Develop conical matrix based on Reachability Matrix value.

Table 11. *Conical Matrix*

	1	2	3	4	5	6	7	8	9	DP	R
1	1	1	1	0	1	0	0	1	0	5	2

	1	2	3	4	5	6	7	8	9	DP	R
2	0	1	1	0	1	0	0	0	0	3	3
3	0	0	1	0	0	0	0	1	0	2	4
4	0	0	1	1	0	0	0	1	0	3	3
5	0	0	1	1	1	1	1	1	0	6	1
6	1	0	1	1	1	1	0	1	0	6	1
7	0	0	1	1	1	0	1	1	1	6	1
8	0	0	0	0	0	0	0	1	0	1	5
9	0	0	1	1	1	0	1	1	1	6	1
D	2	2	8	5	6	2	3	8	2		
L	5	5	1	3	2	5	4	1	5		

f. Construct Digraph

Based on Level Partitions graphs are constructed. This graphh describe the relationship between influencing factor.

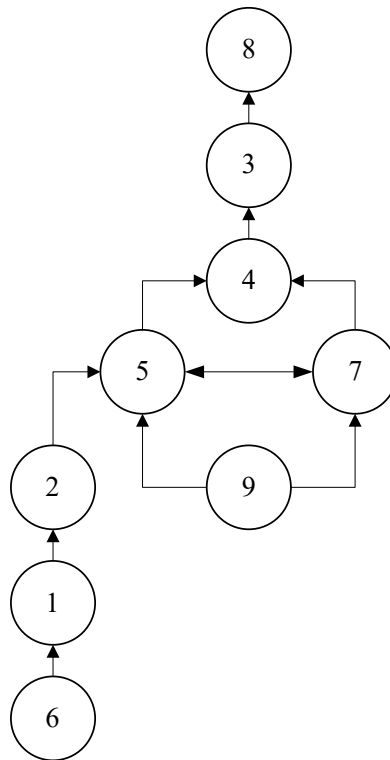


Figure 1. Digraph of influencing factors

g. Construct Interpretative Structural Modelling (ISM) Model

Return the description into its symbolization.

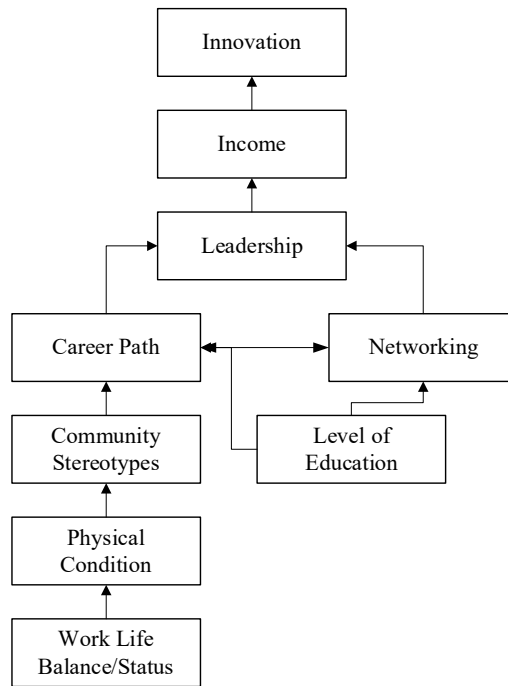


Figure 2. The Result of Interpretative Structural Modelling (ISM) Model

h. Build MICMAC Analysis

The last step in ISM is interpret the result and mapping into MICMAC graph. The MICMAC graph shows in Figure 3.

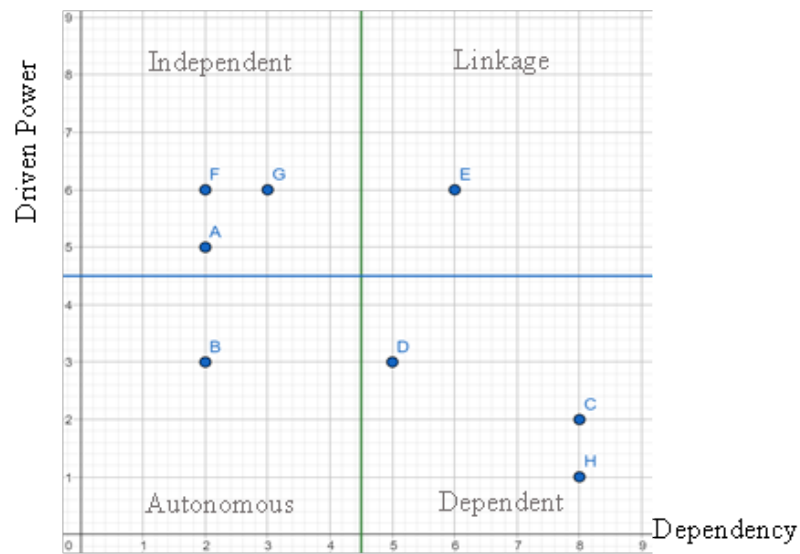


Figure 3. The Result of MICMAC Analysis

Description Factors:

A= Physical Condition
 B= Community Stereotypes
 C= Income
 D= Leadership

E = Work life Balance,
 F = Level of education
 G = Networking
 H = Innovation

4.2 Discussion

Physical condition is understood as physical endurance or body endurance. If viewed in the logistical field, in contrast to the statement from Amir and Suhartini, in fact the field findings show that it is not absolute that the roles of women and men are determined only based on physical conditions. This is because physical condition is an aspect that can be developed according to habits and has a saturation point for men and women. So, it can be concluded that the influence of physical conditions is relative, and the effect is more on individuals than generalizing one gender. The next factor is related to Community Stereotypes. Amir and Suhartini (2018) state that public perceptions produce social, and women's roles have begun to shift with what is found in the field. If we look at the logistics sector, along with the times and efforts to empower women, now women have the right to make life choices, one of which is to participate in the world of work. So, the conditions in the field update the previous literature that the influence on people's perceptions has faded, women have understood their nature and this is then used as the basis for principles and personal beliefs. The third factor is income. In line with the statements of Tzannatos (1999), Zinn et.al (2018), and Pereira & Salaris (2019) that in the logistics sector there are still differences in income between women and men even in one position. Furthermore, refuting the statement from M. Hassanah et al (2019), that in the field of logistics women who participate in it are not affected by family income. Orientation in work tends to lead to personal satisfaction and ambition as self-actualization. The fourth factor is leadership. Contrary to the statement of Zuraik et.al (2020), in the world of logistics, women now take on a lot of leadership roles. This is evidenced by women who can lead and develop their companies during pressure from the logistics and transportation industry.

The fifth factor is career level. In line with Tzannatos's statement (1999) that the phenomenon of Sex Segregation still occurs, including in the field of logistics. The field findings are also in line with Pereira and Salaris's statement (2019) that gender bias still exists and is reflected in gender which is still used as a consideration in hiring workers in a position or positions. The sixth factor is Work Life Balance/Status. In line with Tzannatos' statement, in the field of legal logistics, husbands are recognized. However, the level is not absolute but is input and opinion. The thing that is taken into consideration is children so that it suppresses women's flexibility, and this expands the opinion of Zinn et.al (2018), as well as Wandaweka and Purwati (2021). The seventh factor is Network. Shifting the statement from Zinn et al (2018), in the field of logistics now women have occupied many leadership positions. This condition further contributes to the development of networks or relationships owned by women. However, it is still relevant that women maintain the boundaries of their professionalism. The development of women's networks is strengthened by the formation of women's organizations or communities, one of which is Indonesian Women in Transport and Logistics (IWTL). The eighth factor is innovation. In line with the statement of Gligor et.al (2022), that in the field of logistics, women and men have different approaches to innovation. However, conditions on the ground show that higher job demands do not create detrimental innovations among women. Women who have positions as leaders can find innovations that are able to build and develop their businesses to the level of their business identity. The ninth factor is the level of education. In line with the statement of M. Hassanah et.al (2019), in the field of education logistics plays an important role in determining the ability to adapt and complete work. Education helps women understand work procedures and limitations so they can adapt. Education is evidence of competence possessed by women. Education is used by women as capital to enter and be relevant in the logistics sector.

4.3 The Relationship between influencing Factors

The analysis was carried out based on the Interpretative Structural Modeling (ISM) output model. Based on the conceptual relationship found, it was found that the factor that forms the basis of women's work participation in the logistics sector is Work Life Balance/Status. Work Life Balance/Status refers to women's ability to balance work and office life with work and domestic life. The inability to manage balance can result in physical fatigue which can have an impact on decreased endurance. The physical condition of women is then used as the basis for sex segregation. Women's gentle physique then places women in certain job positions and eliminates their potential in other positions. In other words, stereotypes of gender that are manifested through sex segregation affect women's career paths. On the other hand, the level of education affects career paths and networks. During the process of taking education and carrying out work in one position, humans socialize and develop their network. The higher the level of education, the wider the network of education and access to career opportunities will increase. Various career paths also develop the network they have. Networks and career paths simultaneously influence leadership. It was explained that leadership is formed from character and experience. Experience and character are obtained based on the results of learning and understanding obtained during interactions with the environment. Position in one position also influences views that produce leadership style and decisions.

Good leadership will lead to the organization's survival, development and progress which can be indicated through revenue. The better the leadership that is executed, the income earned will increase, conversely if the leadership that is not well executed will have an impact on decreasing income. These gains are accompanied by demands for innovation. Based on the Matrice d'Impacts Croises-Multiplication Application an Classment (MICMAC) Analysis, the driving force and factor dependence are described. Community stereotype factors belong to the autonomous category with low thrust and/or influence values and low dependence on other factors. Factors of income, leadership, innovation belong to the dependent category with low driving force or influence and have a high dependence on other factors. Factors of physical condition, work life balance/status, network, and education level belong to the independent category with high driving force and low dependence on other factors. The career path factor belongs to the linkage category with a low push or influence value and has a high dependence on other factors. Career path is the dominant factor.

5. Conclusion

There are nine factors that influence women's work participation in the logistics sector, namely physical conditions, stereotypes society, income, leadership, career path, work life balance/status, network, innovation, and level of education. Physical condition, societal stereotypes, income, leadership, career level, work life balance/status, network, innovation, and level of education have a unidirectional and/or reciprocal relationship with other factors. Based on the conceptual relationship found, it was found that the factor that forms the basis of women's work participation in the logistics sector is Work Life Balance/Status. The inability to manage balance can result in physical fatigue which can have an impact on decreased endurance. The physical condition of women is then used as the basis for sex segregation. Women's physique places women in work positions and eliminates their potential in other positions.

Gender stereotypes that are manifested through sex segregation affect women's career paths. On the other hand, the level of education affects career paths and networks. The higher the level of education, the wider the network of education and access to career opportunities will increase. Diverse career paths also develop your network. Networks and career paths simultaneously influence leadership. Leadership is formed on character and experience. Experience and character are gained while interacting with the environment. Position in one position also influences views that produce leadership style and decisions. Good leadership will lead to the organization's survival, development and progress which can be indicated through revenue. Simultaneously, these gains are accompanied by demands for innovation. This research only discusses the factors that influence work participation for women in the logistics industry, further research can be carried out in other industries so as to produce a generic model of woman's work participation. This research only discusses the factors that influence women's work participation, it is also necessary to analyze the obstacles that might reduce the level of participation.

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