

Providing an optimal integrated model of the chicken supply chain based on the human resource management approach

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Abstract

This research was carried out with the aim of providing an optimal integrated model of the chicken supply chain based on the human resource management system among the group of well-raised poultry farms in the whole country. In terms of the purpose of this research, it is the type of applied and exploratory research; And from the point of view of the method of collecting information, it is descriptive and survey type (due to the use of a questionnaire). The statistical population of the research was all the employees of Behparvor Group's poultry farms in the whole country, based on the table of Karjesi and Morgan, 337 people were selected as a sample, and the same number of questionnaires were distributed and collected. A research questionnaire based on interviews with the company's experts in the form of four dimensions of the challenges of the chicken production supply chain with an emphasis on the human resource management approach, the success factors of the chicken production supply chain with an emphasis on the human resource management approach, the limitations of the chicken production supply chain with an emphasis on the resource management approach humane and optimal supply chain of chicken production was designed. The information collected by questionnaires was analyzed by SPSS and Smart PLS software using structural equation modeling. The analysis of the research hypotheses using structural equation modeling at the 95% confidence level showed that the challenges of the supply chain of chicken production with an emphasis on the human resource management approach have a negative and significant effect on the optimal supply chain of chicken production. The success factors of the chicken production supply chain with emphasis on the human resources management approach have a positive and significant effect on the optimal supply chain of chicken production. The limitations of the supply chain of chicken production with emphasis on the human resource management approach have a negative and significant effect on the optimal supply chain of chicken production.

Keywords: supply chain, chicken supply chain, human resource management
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1 Introduction

Perhaps the biggest problem of production and service organizations after managing relationships with customers is the proper management of the supply chain and provision of production and service needs. Today, organizations can no longer succeed in gaining competitive advantages and increasing their market share as a separate production or service

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unit, and they need a planned and principled partnership with their suppliers and customers. This partnership requires a careful and systematic supervision, if it is neglected, the declining organization will turn and give its competitive share to competitors or new entrants to the existing industry. Achieving a value chain that can coordinate partner organizations in terms of organization, production and strategy will create a single goal, which is customer satisfaction. This chain should always be in line with the customer's tastes to create confidence in him. By passing from the period of product orientation to the period of market orientation and the post-industrial period, the competition of companies became more complicated and intensive by gaining a higher share of the existing market, which resulted in a dynamic and changing environment. In this competitive environment, customers gained more power in choosing their desired products and services [2].

Today, supply chains have become an essential part of life, although it may not be so obvious at first glance. What began as small-scale regional trade networks centuries ago have evolved in recent decades into an interconnected system spanning all inhabited continents. The geographic scope and value of supply chains have grown and now have more stakeholders than at any time in the past; Owners and agents with direct financial interests, private citizens who depend on vital goods such as food and medicine every day, and local and national governments who are responsible for providing energy and other services needed by their population [5]. Food supply chains face challenges of sustainable supply chain management such as waste management and environmental issues. The integration or integration of the system for chicken and poultry production, which is managed by the main companies, is one of the food supply chains to achieve the goals of sustainable development in a poultry supply chain [22].

One of the major elements in management is planning with a human resource management approach. Planning in the field of human resources is the foundation of management elements and a process that organizations combine and integrate in the form of all their activities and efforts regarding the desired goals, the way to reach them and how to go along the path, and the purpose of its implementation is to achieve organizational results. So the management should have proper planning for all the resources under its control. One of these resources, which is considered a strategic resource for organizations, is human resources, which is one of the most important issues of strategic planning [29]. Organizations are trying to find ways to be flexible and improve responsiveness to stay competitive by changing their operation strategy, methods and technologies, which is significant and reflective in the selection and implementation of the supply chain management paradigm. Today, the use of supply chain in business has become global [28].

Usually, until more than four decades ago, in service organizations, management and scientific principles used in production organizations were used, and the belief that achieving economic scale leads to reduction of unit costs is considered as the main feature in management decisions. It would be [4]. From the late 1970s onwards, there is evidence of the transfer and application of lean manufacturing concepts to the service sector; Because this approach focuses on cost management and employee activities; Increasing the productivity of the organization has brought with it [6]. Derived from the definitions and principles of the lean approach, lean human resources management is a set of strategic actions that by strengthening the role of the human resources unit, improves the functions of human resources and by minimizing the waste of employees' abilities and talents, improves financial results and increases customer satisfaction in It follows and follows the supply chain of pure human resources with the aim of meeting the needs of businesses for manpower, by applying the principles of the lean approach in order to employ people aligned with the pure culture in order to make maximum use of their talents and abilities [27]. Familiarity with all the nodes in the supply chain of pure human resources, a better understanding of their dynamic behavior and how each element of this chain is related to the overall operation of the organization makes it possible to separate these relationships and understand that their relative importance is constantly changing. It puts management in a position to develop optimal workforce strategies [30].

Supply chain management is considered as one of the most powerful operational paradigms for improving the competitive advantage of manufacturing and service organizations. Organizations claim that people are their competitive advantages, whether in the form of technical experts, experts specializing in providing appropriate services to customers or insightful managers. In today's era, human resources are paradoxically a success or failure factor for all organizations, especially for their entrepreneurial type. Human resources and supply chain management are important in that they have been identified as one of the requirements to access competitive advantage in the industry. Therefore, the integration between human resource functions and supply chain management enables the company to have a unique strategy, which will consequently improve the company's performance. Human resources and supply chain are fields of study that were previously studied separately despite the secret link among most business environments. For the first time, due to the importance of the subject, Taylor and his colleagues proposed that the two be examined simultaneously in the place where the research is conducted. To ensure success in implementing supply chain management, companies need to fully commit themselves to improving human dimensions [18]. In the research

literature, it is stated that the effective human resources system is an important factor in the implementation of the supply chain in order to improve operational performance. Most authors state that human resource management plays a very important role to support and as a mechanism to operationalize responsibilities and relationships in the supply chain [16].

Like any other commodity, fluctuations in agricultural products also have consequences for both the supply and consumer sides. A high price leads to a decrease in consumer welfare and a low-price lead to losses for producers. Therefore, knowing the structure of the production market of these products is important, and if this structure is accurately identified, it is possible to prevent excessive price fluctuations in the market equilibrium value by timely intervention. In the broiler market, each of the stakeholders of the market receives feedback from each other and other economic components and leads to the formation of the market structure. For example, as the price increases, the demand for the product decreases and its supply by producers increases. Analyzing the market structure of agricultural and animal husbandry products requires a tool that, in addition to considering various variables, can well model the feedbacks and reactions that occur by suppliers and consumers [11]. In Iran, due to the lack of pastures and the high rate of use of the poultry industry, and on the other hand, due to the low level of connective tissue and fat in poultry meat and as a result of its digestibility and high nutritional value, the development of the poultry industry to prepare protein from It is of great importance. Based on a general and brief review of the chicken meat supply chain in Iran, this chain has missing and critical links based on previous studies. Without the fact that these studies have dealt with the exact calculation of the relevant circles [10]. Based on the mentioned contents, the present research seeks to provide an optimal integrated model of the chicken supply chain based on human resource management.

2 Theoretical foundations and research background

Having a unified view of supply and demand, in the form of an integrated system for a product, can be very helpful and desirable in analyzing and predicting the effects of changes, however small and partial, in its components [26]. Supply chain management is one of the most important competitive strategies to increase productivity and profitability in any organization. The concept of "supply chain management" with the aim of integrating all stages of procurement and distribution of goods and services leads to a change in managers' thinking. This type of attitude not only forces managers to make their organization's functions efficient and optimized, but they must also consider the interests of all links in the supply chain. Because the inefficiency of each of them has a negative effect on the entire chain. The supply chain management approach is completely different from the traditional management that was common before it. In traditional management, the goal of optimization is within the boundaries of a chain link, while in supply chain management, optimization of the entire chain is considered. The result of this coordination and integration in the supply chain links is the provision of goods and services with lower cost and better quality. In traditional management, there was a constant struggle between two successive links of the chain. For example, the producer and distributor were always looking for a better price and keeping less stock. While this fight may weaken or destroy both of them. The consequence of this work is the emergence of a disorder in the entire chain, which all the links are affected by. So the optimization of each of the subsystems does not lead to the optimization of the whole system. But in supply chain management with a holistic view of the system, such problems can be prevented. This requires cooperation and coordination between all links of the supply chain and new planning methods, and the knowledge related to supply chain management seeks to expand this approach [3].

Porter considers the supply chain to include all the activities required to provide a service or product to the end customer. From his point of view, manufacturing and distribution stages are added to the supply chain as a part of the flow of goods and services. In other words, with this approach, the supply chain includes three areas of procurement, production and distribution. This approach can identify all stages of value creation along the chain and examine its position [14].

The supply chain is a network of facilities and production centers that performs the tasks of preparing and supplying raw materials, converting them into final products, intermediaries and distributing these products to customers. Supply chains exist in manufacturing and service organizations, although chain complexity may vary greatly from industry to industry and from company to company. Organizations can create a competitive advantage through leveraging human resource development to provide a wide range of change-oriented and growing characteristics related to the set of critical characteristics of supply chain managers. Supply chain management decisions are extremely important and have a significant impact on the company's financial performance because 75% of the expected income of organizations is based on supply chain activities. Also, the professional capabilities of human resource development in training and development, organizational growth and development, and change management, which help the organization achieve a deeper understanding of supply chain management and supply chain managers achieve more success. Human resource

development professionals can improve the skills and competencies of supply chain managers. Also, the impact of human resource management on improving responsiveness and product quality and reducing costs in the supply chain. Human resource management also plays a significant role in the implementation of supply chain management. The conducted studies state that factors such as information sharing and strategy formulation play an undeniable role in supply chain management and its implementation. Human resource management measures increase customer satisfaction and increase organizational performance [18].

Haq et al. [8], in a research entitled Enhancing supply chain learning and innovation performance through human resource management investigated the effects of high performance human resource management (HRM) on different types of SC learning (for example supplier, customer and internal learning) and innovation performance. This study uses structural equation modeling to examine the conceptual model based on data collected from 213 manufacturing companies in China. The findings show that empowerment improves all three dimensions of supply chain learning, while it improves learner training, and internal learning and teamwork are not related to any dimension of supply chain learning. Human resource management practices also interactively affect the learning dimensions of the supply chain. In addition, customer learning is directly related to innovation performance.

Polhamn et al. [22], in their research entitled the role of the focal company in the sustainable development goals: a case study of the chicken supply chain in the Brazilian food market discussed the role of the focal company to achieve the Sustainable Development Goals (SDG) in the chicken supply chain in Brazil. Contract. The results showed that the agricultural and food focal company has a strategic role in sustainable development. Brazilian chicken supply chains must manage waste and environmental issues. Cooperation and interaction are the strategies of companies to achieve sustainability. Supply chains need guidelines to achieve sustainable development goals. Sustainable Brazilian chicken supply chains use vertical integration.

Akwa et al. [1], in research titled examining the link between green human resource management practices, green supply chain management practices and performance to investigate the impact of green human resource management and green supply chain management practices on operational, market, and financial performance. social and environmental issues. This study was conducted using a partial least squares structural equation modeling approach to analyze data collected through structured questionnaires from supply chain and human resource managers in manufacturing and hotel companies in Ghana. The results showed that green supply chain management practices have a complementary partial mediating role between green human resource management and operational, market, social and environmental performance.

Rajabpour and Afkhami Ardakani [24], investigated the role of green human resources management in the green supply chain in a research titled the relationship between green human resource management and green supply chain. The statistical population of the research consisted of about 700 managers, heads, supervisors and experts of Berzoye Petrochemical Company, and the statistical sample was selected based on Morgan's formula of 207 people. The data collection tool was the researcher-made green human resource management and green supply chain questionnaire taken from Ahmadi, Afshari and Shekhari's research [15], on a five-point Likert scale.

The validity of the questionnaire was examined in terms of form, content and structure, and its reliability was obtained by testing it and calculating Cronbach's alpha coefficient, equal to 0.87. The collected data were analyzed using SPSS and LISREL statistical software. The research results showed that there is a strong significant relationship between green human resource management and green supply chain. Also, the research findings showed that there is a positive and significant relationship between the dimensions of green human resource management (green recruitment and hiring, green training and development, green service compensation and green performance evaluation) and the green supply chain variable.

Selgi et al. [27], conducted research titled Designing a lean human resources supply chain model: a qualitative research based on foundational data theory with the aim of analyzing the issue of lean human resources supply chain. This research is a qualitative research based on the foundational data theory, relying on the philosophical foundations of the interpretation school. The statistical population of the research included senior and middle managers and experts from the Ministry of Cooperatives, Labor and Social Welfare and academic experts, 19 of whom were selected as members of the statistical sample using the purposeful sampling method. The identifiers of the lean human resources supply chain model were collected using semi-structured interviews and analyzed using Strauss and Corbin's three-step coding method (252 key concepts, 43 subcategories, and 25 main categories). Based on the findings of the research, the concept of pure human resources was chosen as the central phenomenon. Causal conditions were placed in the form of two categories of environmental and organizational factors, and the five main categories of preventive planning of demand management, efficiency of search resources, efficiency of evaluation and screening, preparation for recruitment and efficiency of succession system were selected as strategies. The personal characteristics of the managers, the

evaluation of the effectiveness of the recruited human resources, the candidate's employability were identified as strengthening intervenors and illegal relationships, environmental uncertainty, time pressure for recruitment, and the inefficiencies of the government management system were identified as weakening intervenors. The degree of purity of the organizational culture, playing the strategic role of the human resources unit, the flexibility and adaptability of managers, the stability of management, the management of the career path, and the availability and limitations of the organization's resources were determined as the background factors and the foundation of the supply chain of pure human resources. Finally, the consequences of achieving the supply chain of pure human resources were determined at three levels: micro, medium and macro.

Hashminejad and Mohammadian Amir [9], in research entitled "Integrating and improving the performance of green supply chain management using green human resource management" to provide an integrated and coherent framework for evaluating and improving the relationship between green human resource management and supply chain management. Green procurement (GHRM-GSCM) using a fuzzy approach. For this purpose, using a comprehensive review of the research literature, interviews and opinions of experts in Aria ore processing industry, an initial identification of evaluation indicators in green human resource management and green supply chain management was carried out. In the next step, the weight of each criteria and sub-criteria was determined using the fuzzy DEMATEL and fuzzy ANP techniques of causal-disability relationships. The results of this evaluation show that leadership, flexibility, and environmental factors have been identified as influential factors in order of importance, and the optimization of these factors by Aria Mining Industry can lead to the optimization of other factors (influential factors).

3 Mathematical model

In this model, the expected order value (DP) represents the demand forecast for chicken meat. The necessity of defining dp is because it is possible to establish a relationship between the real demand of chicken meat and the optimal amount of chicken breeding and it is calculated in terms of tons per day. In order to adjust the effect of the expected order amount and the openness of the policy maker to change the time period of market demand change, the average time for demand change variable (ADCT) is used. Finally, the DP mathematical relationship that indicates the total demand at different times can be presented as follows.

$$\begin{aligned} \text{Expected order quantity} = \int_0^t \frac{\text{Actual demand}^{(t)} - \text{Amount of pending order}^{(t-dt)}}{\text{Average time to change demand}} dt \\ + \text{Amount of pending order}^{(t_0)} \end{aligned} \quad (3.1)$$

Based on the desired order amount for chicken meat in the previous stage, the desired amount of production is defined, which is equal to the product of the time (days) for the completion of the production cycle (depending on the opinion of the policymakers and the time conditions of production can be changed) by the desired breeding amount. tons) which can be presented as follows

$$\text{Optimal amount of production}^{(t)} = \text{Optimal breeding rate}^{(t)} \times \text{Completion of the production cycle} \quad (3.2)$$

The following formula will be used to adjust the actual production (tons per day) until reaching the expected and desired production level.

$$\text{Production adjustment}^{(t)} = \frac{\text{Optimal production}^{(t)} - \text{Actual production}^{(t)}}{\text{Duration of production adjustment}} \quad (3.3)$$

To obtain the optimal amount of retail inventory (equal to the appropriate amount of chicken meat inventory to cover all the expected demand for this product at a given time). The following relationship was presented.

$$\text{Optimum amounts of retail inventory}^{(t)} = \text{Expected order quantity}^{(t)} \times \text{Time required to cover demand} \quad (3.4)$$

80% of the production cost of each kilogram of chicken is spent on feed and buying day-old chickens (doc). The largest weight of the food composition of poultry farms is related to the two inputs of corn and soybean meal. According to the conversion rate of chicken meat, until the end of the period, for each piece of chicken with CW weight, the amount of POE kg will be consumed.

The next major cost is the cost of buying a day-old chicken (toman), which is 20% of the total price related to this input. For other factors and inputs, which make up the remaining 20% in the basket of costs (30), an amount Fixed (IncOST) will be considered, which of course can be changed. Finally, the cost of producing one kilo of chicken meat is obtained as follows:

$$COP_{(t)} = \frac{POF (corn_{(t)} + soy_{(t)}) + Doc_{(t)}}{CW} + in\ cost \quad (3.5)$$

The adjustment of warehouse stock at the retail level depends on the gap between the actual and desired stock levels and the time required to reach this equilibrium, which is given in equation (3.6).

$$Adjustment\ of\ retail\ warehouse\ inventory^{(t)} = \frac{Desired\ stock\ levels^{(t)} - Actual\ stock\ levels^{(t)}}{Duration\ of\ inventory\ adjustment} \quad (3.6)$$

The desired amount of starting breeding (DRSR) in terms of tons per day at the time is equal to the total amount of desired breeding, which is based on the amount of predicted demand and adjusted production.

$$DRSR^{(t)} = Optimal\ production\ rate^{(t)} + Adjusted\ production^{(t)} \quad (3.7)$$

The starting amount of production (tons per day) depends on the amount of DRSR, as well as the crises created and the duration of cultivation. The crises considered for this research are the sanitary crisis and also the demand crisis in a short period of time due to consumers' fear of bird flu transmission to humans. It is worth mentioning that rearing time is a standard of 42 days, which is observed in almost all poultry farms in developed countries, and from the point of view of export, it is also a standard procedure for the weight benefit of the period. But due to the fact that chickens are kept for more than 42 days in almost all poultry farms in the province, it was decided not to use a fixed number for the length of the rearing period and consider the length of the period to be variable by the decision of the policy maker and to make the production process more flexible.

$$\begin{cases} Production\ start\ amount^{(t)_s} = (1 + Sanitary\ crisis)(DRSR^{(t)}, Breeding\ time) \\ Production\ start\ amount^{(t)_d} = (1 + Demand\ crisis)(DRSR^{(t)}, Breeding\ time) \end{cases} \quad (3.8)$$

The actual quantities of chicken meat produced in each supply chain are obtained by the following equation.

$$Actual\ amount\ of\ production^{(t)} = \int^t [Amount\ of\ production^{(t)} - Production\ loss^{(t)}] + Actual\ production^{(t_0)} \quad (3.9)$$

The following relationship is used to obtain the actual quantities of chicken stock:

$$Actual\ stock\ levels^{(t)} = \int_0^t \left[Slaughtered\ chicken\ entering\ the\ warehouse^{(t)} - Amount\ leaving\ the\ warehouse^{(t)} \right] dt + Inventory\ at\ the\ beginning\ of\ the\ period(t_0) \quad (3.10)$$

This amount is equal to the amount of slaughtered chicken entering the warehouse minus the amount leaving the warehouse, of course, the inventory of warehouses at the beginning of the period is also added to it (units in tons per day). It should be noted that the number of live chickens ready for slaughter is equal to the amount of production at the end of the period, which naturally, if this amount is not equal to the demand for chicken meat, policy makers and officials.

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They are able to fill the gap between supply and demand by buying from other provinces with imports, and the variable of purchasing from abroad (EP) is considered for this purpose. Also, if the supply increases compared to the demand, there is a possibility of exporting or transferring to other provinces. Has that the export variable (EX) will represent this issue.

Of course, in this case, the coefficients of the transfer function will be different only for this amount of production, which causes the production costs to rise and can be out of profit if the specified and defined quota is reached for the price of chicken in the destination countries or provinces. And excess production should be sent to cold stores. It should be kept in mind that frozen chicken is never a perfect substitute for slaughtered chicken. The drop in the price of frozen chicken compared to slaughter chicken will reduce the real income of poultry farmers and will cause a decrease in production in the following periods. Considering that the system considered for this study is a tension-compression system, the amount of breeding and production of chicken meat is planned by the policy makers in the Livestock Affairs Support Organization of Razavi Khorasan Province; But the demand in the real world for various reasons may be different from the calculations made by the planners, and because the transportation of chicken meat is based on the real demand, so the limit of the tension and pressure system will be after the slaughtered chicken is stored. Based on the actual demand for chicken meat, always a percentage of the raised product is marketed as live chicken by poultry farmers. The rest of the raised chickens are sent to the slaughterhouse and after the slaughtering process is finished, they are filled and packed ready for the next stage, which is transfer and responding to the received demand. It is worth mentioning that at this stage, the desired product will face a 5-20% drop depending on the facilities of the slaughterhouse. In estimating the finished price of chicken meat, the side incomes of the production stage are not calculated because these incomes do not belong to the chicken farmer or the seller and belong only to the slaughterhouse. Therefore, this drop can be mentioned as an influential factor in reducing the profit of poultry farmers. To estimate the amount of ready-to-slaughter production, equation (3.11) is used, which is equal to the total amount of production minus the amount of chicken sold live:

$$\text{Chicken ready for slaughter}^{(t)} = \text{Actual production}^{(t)} - \text{Amount of chicken sold live}^{(t)} \quad (3.11)$$

The amount of chicken sold live can also change according to different seasons and religious occasions, so the amount of this variable, which is equal to a percentage (per) of the actual production, can be calculated by equation (3.12):

$$\text{Chicken sold live}^{(t)} = \text{Per} \times \text{Actual production}^{(t)} \quad (3.12)$$

The slaughtered and processed chicken after deducting the loss of production in the slaughterhouse (total chicken meat available to EC) is calculated from the following equation. In this regard, LP or LOSS PRODUCT can be numbered according to different scenarios.

$$\text{Whole meat available}^{(t)} = (1 - \text{loss product}) \times \text{Slaughterable chicken stock available}^{(t)} \quad (3.13)$$

The amount of frozen meat will be calculated from the following equation.

$$\begin{aligned} (\text{Frozen meat} - EX)(t) &= \text{Whole chicken available}(t) - \text{Actual demand}(t) \\ \text{If } EC \text{ output}_g &\geq AD_g \text{ then } EC \text{ output}_g - AD_g = SP_g \\ \text{If } EC \text{ output}_g &\leq AD_g \text{ then } EC \text{ output}_g - AD_g = LP_g \end{aligned} \quad (3.14)$$

Relationship (3.14), shows that if there is a surplus of product production (SP_g), it will be possible to export the surplus of production, freeze chicken, or buy it from the Livestock Affairs Support Organization. To balance the market, the Livestock Affairs Support Organization will also purchase strategic stocks of chicken. The support organization's purchase program is only limited to the purchase of surplus products, and this organization will purchase and store meat in advance for the month of Ramadan and Nowruz, when the demand for chicken meat increases. The organization's purchase limits are given in the following relation:

$$\begin{aligned} \text{Support purchases}_{(t)} &= \sum_{t=1}^n \text{Support purchases}_{(t)} + \sum_{y=1}^m \text{Nowruz purchases}_{(y)} \\ \forall y &= 1, \dots, m \text{ and } t = 1, \dots, n \end{aligned} \quad (3.15)$$

In relation (3.15), it shows the number of years and days of the studied game. According to the budget constraints (OBUD) in the organization as well as the cold storage capacity limitation (FCAP), the following conditions will be imposed on the model.

$$\begin{cases} \sum_{t=1}^n \text{support purchases}_{(t)} \leq FCAP \\ \sum_{t=1}^n \text{support costs}_{(t)} \leq OBUD \\ t = 1, \dots, n \end{cases} \quad (3.16)$$

Availability of suitable reserves for Nowruz Eid is applied by the lower limit.

$$\text{Nowruz purchases}_{(y)} \geq NPUR \quad (3.17)$$

4 The basics of developing research hypotheses

Using the method of organized thinking can help to identify the challenges and problems in the supply chain of livestock products and be effective in adopting policies to solve these challenges. Searching for the challenges in the production and distribution of livestock and agricultural products in order to achieve a competitive advantage and increase the income of activists, requires the identification of the value chain of these products. By identifying the strengths and weaknesses of the food supply chain, policy makers and planners can improve the efficiency of these chains [13]. Nejati et al. [20], found that employees' resistance to change moderates the relationship between dimensions of green human resource management on the green supply chain. This can be one of the dimensions and challenges of the supply chain. Therefore, empowering employees is one of the basic solutions to solve this problem [25]. Based on the stated principles, the following hypothesis was designed:

The first hypothesis: the challenges of the supply chain of chicken production (based on HRM) have a negative and significant effect on the optimal supply chain of chicken production.

One of the success factors in the supply and supply chain is the development of human resources based on training and empowering employees in the field of solving quality-related issues, forming teams to solve chain quality issues with the presence of various representatives of the interested companies in the chain, sharing knowledge and information related to product quality among Human resources and attracting and retaining employees is based on trusting the knowledge and efforts of all employees [21]. This can be one of the dimensions and challenges of the supply chain. Therefore, empowering employees is one of the basic solutions to solve this problem [25]. Based on the stated principles, the following hypothesis was designed:

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The second hypothesis: the success factors of the supply chain of chicken production (based on HRM) have a positive and significant effect on the optimal supply chain of chicken production.

In terms of macroeconomics and the development process, the category of employment and employing trained human resources is very important. The employment market, like other economic markets, has two sides: supply and demand. Most of which is affected by demographic changes, including population growth rate, education and society's culture. The demand side is also affected by the amount of activity and economic and investment activities such as agriculture, industry and services. The chicken supply and demand chain can also benefit from this development process of the employment category [12]. Quality management functions such as identifying and training employees, empowering employees and teamwork can improve organizational performance in the industry by affecting supply chain management [19]. One of the effective components of human resources planning is the intention to leave the job. Leaving the job has an effect on the labor force demand. Among the variables affecting the intention to leave a job, we can mention the moral context and nature of work of businesses. Failure to pay attention to the moral context of the nature of work causes limitations in work and leads to serious harm such as reducing employee commitment, reducing job satisfaction and increasing the intention to leave the job [23]. Based on the stated principles, the following hypothesis was designed:

The third hypothesis: the limitations of the supply chain of chicken production (based on HRM) have a negative and significant effect on the optimal supply chain of chicken production.

The research model is designed based on theoretical foundations and assumptions as shown in Figure (1) and is as follows:

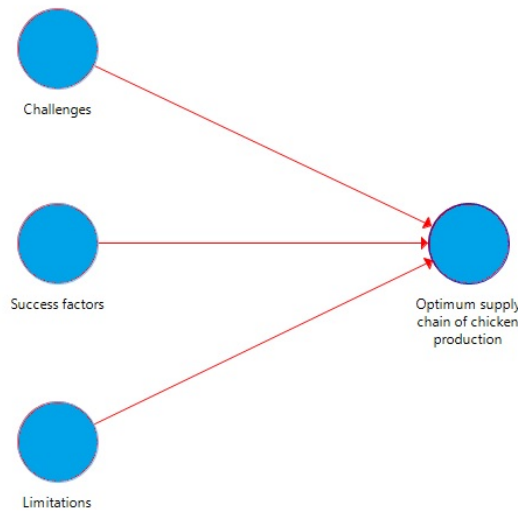


Figure 1: Conceptual model of research

5 Research methodology

In terms of the purpose of this research, it is of the type of applied and exploratory research; And from the point of view of the method of collecting information, it is descriptive and survey type (due to the use of a questionnaire).

In this research, two methods are used to collect information:

1. Library studies: library resources were used to compile theoretical foundations, definitions and concepts, which have been the most important and useful source of articles, theses, conferences and books related to the research topic, databases and information sources and libraries of the country's universities.
2. Field research: in order to collect the desired information for "providing an optimal integrated model of the chicken supply chain based on human resource management", interview and questionnaire methods have been used.
3. The research questionnaire and its dimensions were designed based on interviews with experts and managers of poultry farms of Behparvor Group in the form of 19 items and 4 dimensions as follows.

The statistical population of the present study was considered to be all employees of poultry farms of Behparvor Group. To the available sampling to test the hypotheses and use the modeling of structural equations based on the table of Karjesi and Morgan, the statistical population of the research included all the poultry farms of the Behparvar group, including 2500 people in the whole country, and based on the table of Karjesi and Morgan, 337 people were selected as a sample.

Research hypotheses are analyzed by modeling structural equations using SPSS and Smart PLS software, and a graphical structural model is presented in line with the research topic. The research tool is also standardized by Smart PLS software in terms of validity and reliability. Also, an optimal structural model was provided by Smart PLS software. How to calculate Cronbach's alpha is the following formula calculated in the software:

$$\alpha = \left(\frac{K}{K - 1} \right) \left(1 - \frac{\sum_{i=1}^k S_i^2}{S^2} \right) \tag{5.1}$$

where k is the number of items; S² is the variance of the sum of scores of each respondent. The method of calculating composite reliability is as follows:

$$CR = \frac{(\sum \gamma_i)^2}{(\sum \gamma_i)^2 + (\sum \varepsilon_2)} \tag{5.2}$$

Table 1: items and dimensions of the questionnaire

	Components	Dimensions	Row
CH1	Lack of attention to employee training	Challenges (CH)	
CH2	Competitors' efforts to attract the company's experts		
CH3	The nature of hard work		
CH4	Inability to maintain the company's expert staff		
CH5	Employee resistance to change		
CH6	Leaving the job of the company's expert employees		
SF1	Staff training	Success Factors (SF)	
SF2	Empowering employees		
SF3	staff welfare		
SF4	Employment justice		
SF5	Financial justice		
SF6	Recruitment and retention of employees		
LI1	Lack of skilled labor in the labor market	Limitations (LI)	
LI2	Provision of labor by non-specialists		
LI3	Lack of financial resources to attract specialized labor		
OSC1	Increase market share	Optimum supply chain of chicken production (OSC)	
OSC2	Supply chain coordination		
OSC3	Efficiency and effectiveness		
OSC4	Improve performance		

Table 2: The reliability of the questionnaire is

Variable	Code	Cronbach's alpha	CR
Optimum supply chain for chicken production	OSC	0.843	0.891
Success factors	SF	0.910	0.930
Limitations	LI	0.847	0.904
Challenges	CH	0.737	0.805

As can be seen in the above table, the values of Cronbach's alpha coefficient of all research variables are more than 0.7 and the appropriateness of reliability is confirmed with this index. The values of the combined reliability coefficient of all the studied variables are more than 0.7 and once again it confirms the appropriateness of the reliability of the variables. Factor loadings are calculated by calculating the correlation value of the indicators of a structure with that structure. If this value is equal to or greater than 0.4, it confirms that the variance between the structure and its indicators is the variance of the measurement error. That construct is more and the reliability of that measurement model is acceptable. Of course, some authors such as Liao et al. [17], have mentioned 0.5 as the criterion value of factor loadings. Table (3) shows the factor loadings of the measures (questions) of the first-order latent variables. As can be seen, the factor loadings of all measures are more than 0.5 and acceptable.

Table 3: Construct validity of the questionnaire

Variables	Types	The amount of factor load	The value of the t statistic	Representative reliability	Significance level	Result
Challenges	CH1	0.751	11.134	0.564	0.00	Desirable and meaningful
	CH2	0.806	12.34	0.650	0.00	Desirable and meaningful
	CH3	0.617	7.554	0.481	0.00	Desirable and meaningful
	CH4	0.633	4.225	0.487	0.00	Desirable and meaningful
	CH5	0.604	5.975	0.465	0.00	Desirable and meaningful

continued ...

... continued

Variables	Types	The amount of factor load	The value of the t statistic	Representative reliability	Significance level	Result
	CH6	0.588	6.005	0.464	0.00	Desirable and meaningful
Success factors	SF1	0.818	41.85	0.669	0.00	Desirable and meaningful
	SF2	0.790	33.847	0.624	0.00	Desirable and meaningful
	SF3	0.843	47.744	0.711	0.00	Desirable and meaningful
	SF4	0.868	54.545	0.753	0.00	Desirable and meaningful
	SF5	0.859	47.981	0.738	0.00	Desirable and meaningful
	SF6	0.804	49.985	0.646	0.00	Desirable and meaningful
Limitations	LI1	0.844	19.526	0.712	0.00	Desirable and meaningful
	LI2	0.868	24.217	0.753	0.00	Desirable and meaningful
	LI3	0.900	47.590	0.810	0.00	Desirable and meaningful
	OSC1	0.857	36,750	0.734	0.00	Desirable and meaningful
	OSC2	0.857	43.897	0.734	0.00	Desirable and meaningful
	OSC3	0.816	23.783	0.666	0.00	Desirable and meaningful
	OSC4	0.745	16.873	0.555	0.00	Desirable and meaningful

As it is clear from the above table, the value of t statistic and the level of significance between the items and the variables related to them in all cases are higher than 1.96 and lower than the error level of 0.05 respectively. Therefore, the significance of the relationships between the items and their corresponding variables is confirmed. Also, the standardized factor loading value for all questionnaire questions is more than 0.4, and there is no need to remove any item in the model. Reliability of the factor that is the square root of factor loadings of a standardized factor. It shows how much of the variation in an item (item) is explained by the construct (latent variable) and refers to the variance extracted from an item.

Fornell and Larcker [7], introduced the Average Variance Extracted (AVE) measure to measure convergent validity and stated that in the case of AVE, the critical value is 0.5; This means that the value of AVE above 0.5 shows acceptable convergent validity, and this variable cannot explain more than half of the dispersion of its indicators on average. According to the values obtained for this criterion which can be seen in Table (4), it can be said that all the constructs of the measurement model have high convergent validity.

Table 4: Average values of extracted variance

Variable	Code	AVE
Optimum supply chain for chicken production	OSC	0.673
Success factors	SF	0.690
Limitations	LI	0.759
Challenges	CH	0.616

In PLS, this is checked by means of a matrix, where the cells of the matrix contain the values of the correlation coefficients between the constructs and the square root of the AVE values of each construct. In Table (5), the values related to the correlation coefficients between the constructs and along with the root values of AVE, which is on the main diameter, are reported; This model has an acceptable divergence if the numbers in the main diameter are greater than the values below and to the right. According to the results of table (3), the root value of AVE of all variables is greater than the correlation value between them, so it can be said that the divergent validity of the measurement models is confirmed.

Table 5: Divergent validity (Fornell and Larcker method)

	Optimum supply chain for chicken production	Success factors	Limitations	Challenges
Optimum supply chain for chicken production	0.820			
Success factors	0.517	0.831		
Limitations	-0.279	-0.239	0.871	
Challenges	-0.268	-0.236	0.078	0.645

6 Research findings

In this part, the descriptive statistics of the studied variables are discussed first, and then the inferential statistics and data analysis methods related to the structural model of the research are mentioned. Table (6) shows the mean, standard deviation, skewness and kurtosis of the research variables.

Table 6: Descriptive statistics of research variables

Elongation	crookedness	standard deviation	Average	Code	Items
-0.084	-0.425	0.379	1.92	CH	Challenges
0.055	-0.77	0.776	3.66	SF	Success factors
1.095	1.224	0.831	2.02	LI	Limitations
0.412	-0.492	0.715	3.64	OSC	supply chain

Before a test is performed or a generalization is applied to the data, the type of data distribution of the studied variables should be determined so that an appropriate and scientific statistical method can be used based on the type of data distribution. Kolmogorov-Smirnov test was used to check the type of data distribution.

Table 7: The results of the data distribution type test

Variables	Kolmogorov Smirnov		result
	The value of the statistic		
Challenges	0.178	not normal	not normal
Success factors	0.154	not normal	not normal
Limitations	0.273	not normal	not normal
supply chain	0.146	not normal	not normal

As it is clear in the above table, the significance level of the Kolmogorov Smirnov test for all variables is less than the error level of 0.05. Therefore, it can be inferred that the data distribution of all variables is not normal and methods should be used according to the type of data distribution. Figure (2) and Figure (3) show the structural model of the research in the mode of estimating standard coefficients and estimating t values. Table (8) shows the significant t coefficients for the relationships between research constructs.

Table 8: Path coefficients and significance coefficients t for the relationships between research constructs

The path of relationship between hidden structures	Path coefficients	t-value	Conclusion
CH- ζ OSC	-0.150	3.663	It is meaningful
SF- ζ OSC	0.443	9.299	It is meaningful
LI- ζ OSC	-0.162	3.211	It is meaningful

Analysis of the first hypothesis: Examining the coefficient of the effect of the challenges of the supply chain of chicken production on the optimal supply chain of chicken production in the above table shows that this path coefficient is estimated at -0.150. Considering that the significance value (t-value) is equal to 3.633 and is greater than 1.96 and the significance level is less than 0.05; It can be concluded that this path coefficient is significant at the error level of 0.05; That is, the challenges of the supply chain of chicken production have a negative and significant effect on the optimal supply chain of chicken production. With an increase of one standard deviation in the scores of chicken production supply chain challenges, we will see a decrease in the chicken production supply chain favorable scores by -0.150 standard deviation. Therefore, the challenges of the supply chain of chicken production will reduce the optimal

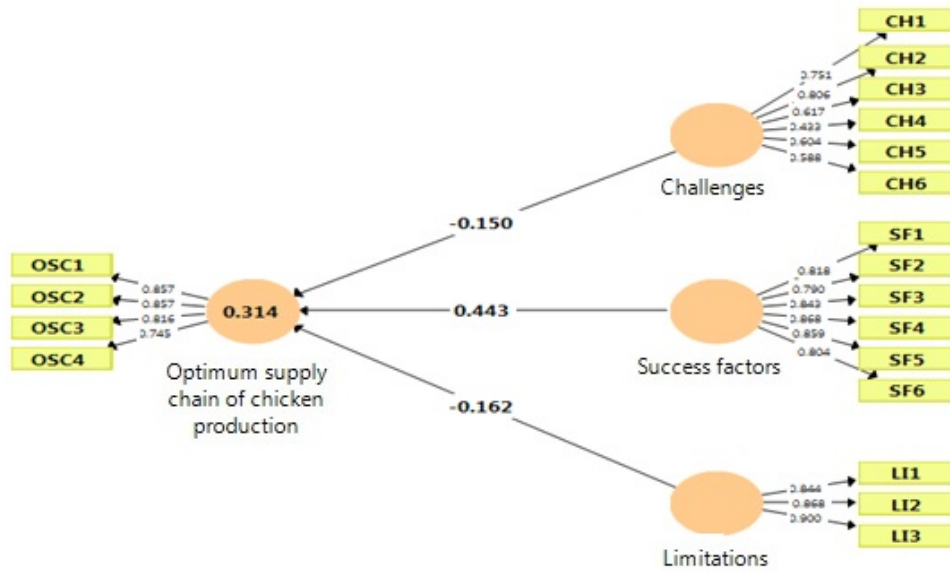


Figure 2: Structural model in standard coefficient estimation mode

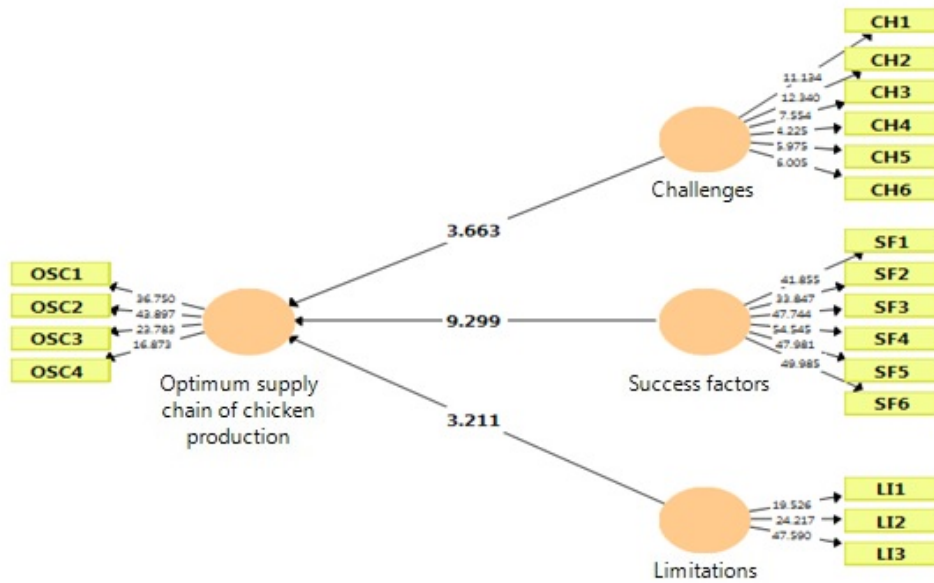


Figure 3: Structural model in the mode of estimating t values

supply chain of chicken production. Therefore, according to the collected data, it can be said that the first hypothesis of the research that there is an effect of the challenges of the supply chain of chicken production on the optimal supply chain of chicken production is confirmed with a probability of 95%.

Analysis of the second hypothesis: The study of the effect coefficient of the success factors of chicken production supply chain (based on HRM) on the optimal supply chain of chicken production in the above table shows that this path coefficient is estimated at 0.443. Considering that the significance value (t-value) is equal to 9.299 and is greater than 1.96 and the significance level is less than 0.05; It can be concluded that this path coefficient is significant at the error level of 0.05; That is, the success factors of the supply chain of chicken production (based on HRM) have a positive and significant effect on the optimal supply chain of chicken production. By increasing one standard deviation in the scores of chicken production supply chain success factors (based on HRM), we will see an increase in the optimal chicken production supply chain scores as much as 0.443 standard deviations. Therefore, the success factors of chicken

production supply chain (based on HRM) will increase the optimal supply chain of chicken production. Therefore, according to the collected data, it can be said that the second hypothesis of the research that there is an effect of the success factors of the chicken production supply chain (based on HRM) on the optimal supply chain of chicken production is confirmed with a probability of 95%.

Analysis of the third hypothesis: Examining the effect coefficient of chicken production supply chain constraints on the optimal supply chain of chicken production in the above table shows that this path coefficient is estimated at -0.162. Considering that the significance value (t-value) is equal to 3.211 and is greater than 1.96 and the significance level is less than 0.05; It can be concluded that this path coefficient is significant at the error level of 0.05; That is, the limitations of the supply chain of chicken production have a negative and significant effect on the optimal supply chain of chicken production. With an increase of one standard deviation in the scores of chicken production supply chain constraints, we will see a decrease in the scores of the optimal chicken production supply chain as much as 0.213 standard deviations. Therefore, the limitations of the supply chain of chicken production will reduce the optimal supply chain of chicken production. Therefore, according to the collected data, it can be said that the third hypothesis of the research that there is an effect of the limitations of the supply chain of chicken production on the optimal supply chain of chicken production is confirmed with a probability of 95%.

7 Conclusion

This research was done in the group of poultry farms of Behparvor Group. According to the opinion of professors, experts and managers of poultry farms of Behparvar Group, a questionnaire based on 4 dimensions and 19 components (items) was designed to examine and test hypotheses. The analysis of research hypotheses using structural equation modeling at the 99% confidence level showed that the challenges of the supply chain of chicken production based on human resource management will reduce the optimal supply chain of chicken production. Haq et al. [8], one of the challenges of the supply chain is the lack of learning, i.e. (lack of training of employees), which is a desirable obstacle for the chain. This can be solved through human resource management practices. In some ways, this finding is in agreement with the findings of the present research. Nejati et al. [20], found that employees' resistance to change (challenge) moderates the relationship between dimensions of green human resource management on the green supply chain. In some ways, this result is in agreement with the findings of the present research. Also, Rastegar et al. [25], showed that it is one of the dimensions and challenges of the supply chain.

Therefore, empowering employees is one of the basic solutions to solve this problem. The second hypothesis showed that the success factors of the supply chain of chicken production based on human resource management will increase the optimal supply chain of chicken production. Rajabpour and Afkhami Ardakani [24], showed that there is a positive and significant relationship between the dimensions of green human resource management (green recruiting and hiring, green training and development, green service compensation and green performance evaluation) and the green supply chain variable. In some ways, this result is in agreement with the findings of the present research. The third hypothesis showed that the limitations of the supply chain of chicken production based on human resource management will reduce the optimal supply chain of chicken production. Hosseini et al. [12], state that in terms of macroeconomics and the development process, the category of employment and employing trained human resources is very important. The supply and demand chain of chicken can also benefit from this process of development of the employment category. The lack of specialized labor in the labor market is one of the limitations of the chicken supply and demand chain that can have a negative effect on productivity. In some ways, this result is in agreement with the findings of the present research. Ostadi et al. [21], stated that one of the success factors in the supply and supply chain is the development of human resources based on training and empowering employees in the field of solving quality-related problems, forming teams to solve quality problems in the chain with the presence of various representatives of the interested companies in the chain, knowledge sharing And information related to product quality among human resources and attracting and retaining employees through trusting the knowledge and efforts of all employees.

Based on the results, managers of Behparvor Group's poultry farms with multi-year planning in the field of supply chain challenges such as employee training, competitors' attempts to attract the company's experts, the nature of hard work, the inability to maintain the company's experts, resistance Employees should maintain the productivity and efficiency of their chicken production supply chain through in-service training, succession planning, providing short and long-term competitive strategies against changing and leaving the jobs of the company's expert employees. Based on the results, to the managers of Behparvor Group's poultry farms by creating and increasing employee empowerment, employee welfare, job justice, financial justice and attracting and retaining competent and expert employees through a written program with the world's latest method and research and development in this field. increase the efficiency and effectiveness of their chicken production supply chain. Based on the results, the managers of Behparvor Group's

poultry farms should improve the performance of the supply chain of chicken production by creating a systematic human resources development and management system in attracting and maintaining human resources and optimal use of financial resources in this field. Researchers are suggested to present an integrated model of food supply and supply chain based on human resource management in the country in future research. It is also suggested to use the role of information technology in future researches in providing the optimal integrated supply chain model based on human resource management. One of the limitations of the research was the lack of supply chain agility in the examined model, so it is suggested that in future researches, they should provide the optimal supply chain agility model based on human resource management. Finally, it is suggested that in future research, this research should be investigated in heavy industries and parent industries.

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