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Research Paper

A Hybrid Approach in Designing and Validating a Green Quality Management Model in the Food Industry

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Abstract

In recent years, global reports on the irreparable damage of human economic activities to the environment, the need for efficient management systems capable of reducing pollutants and waste management and the optimal use of non-renewable resources, more than any other another time is needed. Therefore, in order to achieve this, a study was presented with the aim of designing and validating a model for green quality management in the food industry. The present study is an exploratory combination that through qualitative strategies with library study methods and grounded theory, a conceptual model is obtained and then through a quantitative strategy of structural equations with Smart PLS approach, the conceptual model of the research is tested and its goodness is calculated. Is. In the qualitative section, after extensive study in the theoretical literature on the subject and taking notes, as well as through theoretical and purposeful sampling with a selection of 24 experts and officials, a semi-structured interview was conducted. In the quantitative part, according to the Vinzy rule, 192 managers and experts of the food industry have been selected as a sample and the data have been collected using a researcher-made questionnaire. According to the findings of the

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qualitative section and after coding, finally 5 main categories and 19 sub-categories were extracted that green management of human resources from causal conditions and green management thinking as underlying conditions, technology management and environmental management system as intervening conditions. Green management innovation was selected as a strategy and also green supply chain as a consequence of green quality management model. The results show that the conceptual model designed with grounded theory approach was approved by experts and the GOF criterion was used to validate the model, which is higher than the level of fit classification based on the theory of Wetzel's et al. (2009) which indicates that has it.

Keywords *A Hybrid Approach, Validating, Green Quality Management, Food Industry, Grounded Theory, Partial Least Squares*

Introduction

Today, companies can rarely ignore the issue of quality management in their work routine, which refers to various management methods and application planning to improve quality, reduce costs and improve productivity, as well as increase the social and competitive performance of the organization (Li et al, 2018). On the other hand, for a stable and effective presence in existing and future competitive markets, existing approaches to quality management, quality management, process redesign and product features based on customer needs and expectations (with today's features) will not be responsible. In other words, today's quality, which is based on cost, delivery time, quality and product performance, will not suffice in the face of new challenges. With all the importance and vital position of quality management system in organizations, it is felt that there is still a clearer and more usable basis for managers and organizations (Davoodi &Yegangi, 2017). The products and processes of organizations created with the logic of traditional quality management have severely overshadowed the quality of life, because the product and process created by the quality approach has

greatly affected the environment and many social costs. Imposed on communities (European Green Management Association, 2015). It is at this point that the thinking of qualitativeism needs to be reconsidered and reorganized, and a new definition of quality based on holisticism presented. On the other hand, the outbreak of coronavirus has exposed the weaknesses of the systems of various industries, including the world food industry, and led governments to believe that fundamental changes must be made in the food industry, international supply chain health and staff training to protect the environment for sustainable development. To make the world resilient to future shocks that will no doubt occur again. Also, with the increasing concerns about the environment, in addition to the development of industries, in the operational process of quality management, all suppliers, manufacturers and distributors must comply with environmental requirements and pursue their affairs in the form of green quality management. So that the world can see less pollution. Although the use of quality management as a mechanism to achieve goals such as customer focus and profitability and cost reduction has become very common today, and most companies try to improve their position in the competitive market to implement these principles within their organization, but in At the same time, the increase in pollution and environmental problems, which is a reflection of today's modern world, has caused concern among governments and organizations to use green measures in various quality management processes; Because green management has been considered as an important organizational philosophy in reducing environmental risks and a preventive approach to increase environmental performance and achieve competitive advantage in organizations (Ghorbanpour et al, 2016). Today, paying attention to the environment and eliminating the factors that cause environmental pollution has been considered by many communities;

therefore, many companies tend to be active in this field and expand green measures and innovations. In the age of the environment, to implement environmental management, it is not only necessary for companies to adapt to preventive strategies, but it is also important that to take advantage of green opportunities and green innovations, models Businesses, change their management activities and thinking, as a result, green management has become one of the most important functions in today's business, and concepts such as green production, green marketing, green industry, green accounting, green design Etc. have been involved in gaining environmental opportunities in business management (Cheng et al, 2014). Among these, one of the industries that has a great position not only in our country but also in the world is the food industry. This position includes the value of food security, the number of employees in this industry, maintaining the health of people in the community and has a significant share in the country's exports. Therefore, in the upstream documents, the issue of sustainability of the food industry has been raised as one of the basic discussions and strategic strategies of this industry in the horizon of 1404. Since most food products are perishable, eliminating waste, reducing supply chain time, and adapting to environmental standards are of undeniable importance (Tafreshi et al., 2017). In the next degree, it is a matter of our country's specific capacities, and also, we have the issue of organic and natural raw materials, quality products and special and rare raw materials in our country, which are usually less found in developed countries. The global consumption approach has not changed towards the consumption of genetically modified products. This is also an opportunity for the country's food industry, and therefore, the food industry can be one of the pillars of the country's development. On the other hand, one of the most important factors that can provide the basis for the development of competitiveness of the food industry in the country is access

to quality raw materials and environmentally friendly at a reasonable price, in other words, considering green quality management, because safety and health Food is one of the most important and practical words that has a special place in the world economy and food industry today and has attracted the attention of politicians, researchers and officials. Food security means that all members of a society have access to healthy, sufficient and quality food throughout their lives, so that its production, consumption and waste do not always hurt the environment. Therefore, according to the studies, it is clear that one of the obvious study gaps in the country's food industry is the unavailability of a native green quality management model, of course, the food industry in Ardabil province is no exception. Therefore, the present study is important both theoretically and practically. Because theoretically, conducting this research could largely cover the lack of a study gap, a model of native green quality management in the country's food industry; And in practice, the model presented by this study can be used by production units active in the country's food industry and help them in the process design and production of green products. Therefore, the purpose of this study is to design a green quality management model in the food industry with a data theorizing approach. According to this; the main questions of this study are: 1. how is it possible to identify the dimensions raised in management theories and models with a green approach to improve environmental performance in the food industry? 2. How is it possible to identify the dimensions related to quality management and green quality management? 3. Is the model designed for green quality management in the food industry valid?

Literature Review

According to the researches related to the present subject, no researches have been done inside and outside the country and it is an innovative subject. Therefore, the researcher has used the background of issues related to green quality management such as (green management, green economy, green productivity, green industry, green process innovation, green human resource management, green supply chain, etc.). Green management knowledge is a new management concept that focuses on sustainable organizational success. In other words, based on the green management model, components and criteria are provided to the organization that, while creating the ability to measure performance with new approaches, lead the organization to sustainable success (Siegel, 2009). Today, organizations can properly play their role that is aware of their organizational social responsibilities and on the other hand, by establishing an environmental management system, reduce costs (Chen & Cheng, 2013). Aside from the inherent benefit of caring for the environment, the biggest benefit of green management to large corporations is that it has made their name and brand more popular with the general public. In general, the benefits of green management can be seen in three parts: environmental benefits, positive economic effects, and social aspects. Companies, organizations, and institutions that are committed to implementing green management can enjoy economic savings, serving the environment, and having a social reputation. Companies that have stronger standards in the field of green management, their employees from They have a higher spirit. On the other hand, companies that have implemented green management have been able to reduce their costs. Green management is a kind of intellectual review of the work of various institutions and organizations to the environment. Green management, known as "going green," is often referred to as an active

environmental strategy. Today, firms strive to carry out their green management activities by the company's business ethics and social responsibility requirements. From a business ethics perspective, green management can improve organizational performance while helping companies to protect the natural environment (Young et al, 2017). In our country, taking into account the global view of the countries' commitments to climate change and the need to pay attention to the environment, as well as the environmental crises that the country is currently involved in, the conditions that are necessary from the perspective of economic development plans. Let's solve the unemployment crisis and protect the environment together, and in this regard, creating green jobs will be one of the most important measures in this field. Educating and empowering people in the field of environmental protection along with economic development is very key and strategic, and the world has moved in this direction. Creating green jobs related to new technologies such as new energy is one of the measures that is developing in the world, but our country is far behind in terms of strategic goals for the use of new energy (Danaei Fard, 2007). Also, the implementation of green management in manufacturing companies will bring benefits to the company, employees, and consumers of products or services and in general to the country's economy. Costa et al (2020) in their research state that the adoption of the Six Sigma approach has a positive effect on the performance of the food industry. More experience in Six Sigma increases the potential benefits of the food sector. They believe that we need to increase managerial awareness of Six Sigma to improve corporate performance and competitiveness. However, the adoption of this approach in the food industry is still very low because this sector is unfamiliar with innovative measures. Abbasi Bastami et al (2020) in a study to select suppliers based on lean green production have performed by goal

programming, fuzzy DEMATEL, and quality performance expansion. The statistical population of this research consists of personnel (managers, assistants, and experts) of Pars Khodro Company. The results of this study show that continuous improvement to achieve lean green indicators is the main element of the production system at Pars Khodro Company. Abbas (2020) in his research entitled "The effect of overall quality management on the company's green performance through the mediation of corporate social responsibility" states that TQM significantly affects the company's green performance. Total quality management has a positive and significant effect on corporate social responsibility and also affects the relationship between total quality management and green performance and company size plays an important role in the relationship between total quality management and green performance. Li et al, (2018) in a study entitled "The impact of quality management on green innovation" emphasized that companies as key participants in various environmental issues, face a lot of pressure from various stakeholders to green management in business practices enter themselves. The purpose of this study is to provide preliminary evidence on the impact of corporate quality management on green innovation and the moderating role of environmental regulations in this regard. Data from 100 companies registered in China from 2008 to 2014 show that quality management has many negative effects on the implementation of corporate green technology innovation and green management innovation. Environmental regulations mainly reduce the negative effects of quality management on green management innovation and green technology innovation. Masri and Jaaron (2017) in a study entitled "Study of the impact of green human resource management work on environmental performance in the Jordanian Health Organization" using a comprehensive review of articles and field data obtained from hospital managers in health care

organizations and Jordan Health proposed three key tasks of green human resource management: green recruitment and selection, green education and development, and green rewards. Their findings showed that the performance of a group of green tasks was moderate and there was a positive statistical relationship between individual green human resource management tasks and environmental performance. The strongest correlation was with employment and green selection, while the weakest correlation was with education and development. Yang et al (2017) conducted a study entitled "Strategic Flexibility, Green Management, and Company Competitiveness in an Emerging Economy." In this study, by combining the perspective of dynamic capability and institutional theory, how companies in emerging economies respond to the pressures of green management is shown and by adopting green management practices, they measure what they achieve. Using data from 272 Chinese companies based on responses from two key experts in each firm, this study shows that strategic flexibility has a positive effect on green management practices and institutional support moderates this relationship by strengthening the positive effect. Zuhairah and Noor Azman (2015) in a study published in "Green Logistics Management and Performance", studied the effects of green marketing strategy on the performance of the Malaysian company "Environmental Management System", holder of ISO 14001 certification. The purpose of their study is to review the literature related to green marketing and analyze two factors affecting the performance of the company. Despite the potential for green production and the growing trend of consumers willing to spend money on a green product, previous studies have shown that green marketing faces some challenges. The result is that green innovation and green promotion have a positive impact on company performance. Lee & Yang (2014) in a study entitled "Green Logistics Management and

Performance" stated that the value chain of many businesses is increasingly to show the profitability of their core business, from input logistics to operations, output logistics, Sales marketing, and finally up to service are required. They argue that adopting green logistics management provides an opportunity for Chinese-made exporters to honestly meet the international community's growing expectations for resource conservation and profitably achieve environmental performance. Teixeira et al (2012) confirmed that green education and development is one of the key tasks in developing human resources to the standard level and achieving better performance. Green recruitment and selection have the highest level in health service organizations. This means that the management of the hospitals has prioritized environmental performance in their organization and has an effective recruitment process and green performance, and has prepared the job application form in the best way for environmental protection. Jackson et al (2011) emphasize that a green reward system is a useful tool for green human resource management work. Accordingly, the hospital management should design effective reward criteria that are appropriate for all individuals to attract and retain talented green employees, as most of them prioritize the reward system for working in organizations. Farrokhizadeh (2020) in his research entitled "Study and ranking of factors affecting the management of green supply chain in the petrochemical industry with Demetel approach in Lorestan Petrochemical" acknowledge that the green supply chain has a significant impact on the environment based on coordination Environmental management and supply chain management to control the environmental effects on the product life cycle by sharing information and coordination and cooperation of the entire supply chain. Keshavarzi (2019) in the study "Study of the effect of total quality management on organizational green performance with the mediating effect of organizational social responsibility

in Parsian Sepehr Refining Company" has concluded that total quality management has a positive and significant effect on organizational green performance and social responsibility of the organization. Fotourehchi et al (2020) conducted a study to explain the relationship between corporate social responsibility and green marketing with environmental performance. This research has been carried out using the structural equation method and information obtained from a questionnaire distributed among 39 employees of Artavil Tire Ardabil. Findings showed that the relationship between commitment to social responsibility, green marketing, and environmental performance of companies is positive and significant and the power of commitment to social responsibility on environmental performance is greater than green marketin. Soltani and Amanat (2019) have conducted a study to investigate the mediating role of Kaizen in the relationship between overall quality management and organizational performance. The research method is a descriptive survey and the statistical population of the research is the staff of Shiraz's five gas transmission operations, which is equal to 138 people. The data collection tool is the standard questionnaire of Ang et al, (2016). Data analysis was performed using SPSS software and structural equation modeling. The results of this study show that there is a significant relationship between Kaizen principles and organizational performance. There is a significant relationship between total quality management and Kaizen principles. Finally, there is a significant relationship between total quality management and organizational performance with the mediating role of Kaizen. Bayat and Mohammadnejad (2016) in a study to "study the impact of green innovations on environmental performance and competitive advantage of the organization using previous research." The results of their research show that the existence of green innovation in the organization leads to improving the environmental performance of the organization. They

believe that the biggest problem that every organization faces today is the issue of change and transformation, and certainly, the acceptance of this change by organizations will be one of the biggest factors for the stability and survival of the organization because organizations are constantly with each other. They have competition. Finally, to summarize the content, a summary of studies conducted in the field of different concepts and components of management with a green approach is shown in Table 1.

Table 1.
Summary of Studies Conducted in the Field of Various Components of Management with a Green Approach

Results	**The most important studies**	**Green management components**
Optimal use of resources increases productivity	Mazarezadeh (2015), Mustapha (2017), Abbaspour (2006)	Optimal consumption efficiency
Installation and use of internal meters provide good information for determining the pattern of energy consumption and segregation of consumption. By linking energy consumption to production, a suitable basis for energy efficiency can be created.	Nadafi et al. (2008), Miustafa (2017), Abbaspour (2006), Mousumi (2016), Yu and Hue (2019), Khan (2015), Goswami and Ranjan (2010)	Energy efficiency, energy saving, energy efficiency
Installation and use of internal . meters provide good information for determining the pattern of energy consumption and segregation of consumption. By relating energy consumption to production, a suitable basis can be created for energy efficiency.	Nadafi et al. (2008), Khan (2015)	Resource consumption management
At the highest level, training in the field of green strategies is effective in determining the future	Jabbour (2011), Renwick (2013)	Strategic green training

Results	The most important studies	Green management components
needs of green.		
At the tactical level, training is effective in helping unit managers perform the organization's green activities.	Jabbour (2011)	Green Tactical Training
Green taxes reduce pollution and protect natural resources.	Chan and Chang (2013)	Reduce natural resources, reduce pollution
Using natural light instead of light bulbs is effective in energy efficiency. Consumption of minimum electrical energy in the building causes optimal energy consumption.	Nadafi et al. (2008), Tseng, (2009), Miustafa (2017), Abbaspour (2006), Biswajit (2016), Mousumi (2016)	Reducing energy consumption
Awareness of the people about . the environment leads to sustainable management.	Nadafi et al. (2008)	Socialization of green values
Training of employees and contractors	Mousumi (2016)	Green management culture

Method

This research is fundamental in terms of philosophy, meta-positivism and its approach in the model design stage and in the applied test stage. The research approach was inductive-deductive and its strategy was a combination of qualitative and quantitative strategies that were selected by combining exploratory and explanatory methods. In the qualitative part, to extract the components and design a conceptual model, an extensive study of the theoretical literature and also the data analysis approach of the foundation with a systematic approach (Strauss and Corbin, 1998) were used. How to influence them and determine the validity of the research model through a descriptive-survey research design to collect data and the

approach of structural equations, data analysis was performed. The foundation data method is a theorizing method that uses an inductive approach and is based on three elements of concepts, categories and theories. Grounded theory is a systematic and qualitative way to create a theory that broadly explains the process of action or reaction of a particular subject or phenomenon (Creswell, 2005). And it allows the researcher to develop a theoretical report of the characteristics of the subject, since the design of the green quality management model was the purpose of this study, so the data theory theorizing strategy was chosen to be consistent with this. The stages of work in the present research in the qualitative stage are as follows: 1- Starting the research by presenting research questions 2- Collecting data by studying theoretical literature and also interviews with analysis, until we reach the stage of theoretical saturation 3- Analysis And analysis of information collected by data coding technique (finding concepts) including open coding, axial coding and selective coding 4- Designing a research model using the Strauss and Corbin paradigm model. In this research, using library study (articles related to the theoretical literature of the subject) as well as semi-structured interview technique with a number of officials and experts in the food industry, open codes related to the subject were extracted and open codes using the Foundation's data quality method. It was turned into a framework and then the resulting framework was considered by the experts and approved. In the quantitative part, while formulating the relations and the effect of the variables of the research model, in order to test and determine the validity of the conceptual model, according to the number of questionnaires collected (120 items) from the structural equation modeling method (SEM) with partial least squares approach. PLS was used. Reinartz et al (2004). Consider the following reasons as the most important reasons for using this approach: 1- No need for assumptions about the

distribution of reagents and measurement scale 2- Objectives of forecasting and theorizing 3- Proportionality of PLS with small sample size 4 - Lack of difficult solutions and uncertainty of factors (Azar et al., 2012) .Data Collection tools in the qualitative part, it consisted of two methods: 1- Filing of documents related to management theories with green approach. Direct quotation of extracted concepts was stored electronically in MAXQDA 2020 software to be used in the theoretical coding stage. 2- Second method the data collection method is based on a survey and field approach. The data collection tool at this stage is a semi-structured interview. Due to the exploratory nature of qualitative research in this study, open-ended interview protocols were used. Since this study uses data-based theorizing strategy, so the interviews started using an initial protocol, then with the progress of the interviews and the identification and discovery of new concepts and categories in the research model, the interview protocol is completed and its questions are followed by the model. An exploratory concept developed and evolved. The interview process continued until the theoretical saturation was reached. In this research, in order to validate the categories and their relationships, the researcher has tried to modify the theory regularly by repeatedly returning to the research data, ie the continuous interaction between what is known and what should be known, in addition to the conceptual density of The conceptual distinction should be necessary and specific, then with the aim of improving the model and increasing its validity with a number of key interviewees and supervisors during a meeting to review the model and after obtaining their comments and applying some modifications to the proposed model Has been obtained. In the quantitative part, a researcher-made questionnaire was developed whose indicators were extracted according to the literature and theoretical foundations of the research and with regard to the qualitative part of the research, which

included 70 statements based on a 5-point Likert scale to receive the opinions of managers and experts in the food industry. The statistical population of the study is the qualitative section of officials and experts of economic units active in the food industry of Ardabil province. In this study, the sample size is about 24 officials and experts in the food industry who have been selected as targeted theoretical sampling. In the qualitative approach, the main focus is on the depth of research instead of the scope and the criterion for determining the number of samples is "theoretical saturation" (Hooman, 2014). Theoretical sampling is a type of purposeful sampling that assists the researcher in creating or discovering a theory or concepts whose theoretical connection with the developing theory has been proven. This means that people are selected for the interview who can be effective in understanding the research problem and the central phenomenon of the study. Sampling was continued until theoretical saturation was reached. In this study, from the eighteenth interview onwards, the number of new codes was gradually reduced so that from the twentieth interview onwards, no new code was found to ensure the comprehensiveness and validity of the research, and also to reach theoretical saturation, the data collection process up to twenty-four the interview continued. Quantitatively, managers and experts in the food industry who were aware of green concepts formed a statistical population to determine the sample size, although it was possible to use the Cochran's formula (sample size of a population of 286 at a 95% confidence level of 164), but Given that the SEM method and PLS approach were used in this study to test the model, based on the Vinzy Rule, Vinzy et al (2005), Believe that determining the sample size in terms of 20 items for each latent variable can be very reliable. Therefore, in this study, considering that there were 6 hidden variables in the final conceptual model, at least 192 samples were selected. Validity and reliability of research in the

qualitative part, a combination of qualitative methods including external auditor supervision, member control, comprehensiveness, and peer review was used. The results of theoretical coding were studied and reviewed by 5 management professors as well as 4 food industry experts. In the quantitative part to ensure the capability of data collection tools in measuring the purpose, first, the content validity of the questionnaire qualitatively and quantitatively and also its formal validity was confirmed by receiving the opinions of 10 experts and after making the necessary corrections. With the help of Smart PLS2 software, validity at the structural level, including convergence validity and divergence validity was calculated and confirmed. Combined Reliability (CR) to determine the reliability of each structure, in addition to the traditional Cronbach's alpha criterion, they use a more modern combination of reliability criteria. The advantage of this criterion over Cronbach's alpha coefficient is that the reliability of structures is not calculated in absolute terms but according to the correlation of their structures with each other. Both criteria are used to better measure reliability. A composite reliability value above 0.7 for each structure indicates good internal stability for the measurement models and a value less than 0.6 indicates a lack of reliability. Combined reliability values for research structures higher than 0.8 were obtained. Convergent validity (AVE) after checking the reliability criterion, the second criterion is the fit of convergent validity measurement models and the criterion of mean-variance extracted is used to measure convergent validity. The degree of correlation of each structure with its questions or indicators is examined. The AVE criterion indicates the average variance shared between each structure with its indices and a value of 0.4 or higher is sufficient. Here, convergent validity values for research structures higher than 0.5 have been obtained. Also, according to the Fornell and Larcker matrix table 2, since the value of the AVE root for

each structure (current variables) in the present study, which are located in the cells in the original diameter of the matrix, the amount of correlation between them in the lower and right cells of the original diameter, more than; Therefore, it can be said that in the present study, model constructs have more interaction with their indicators than with other structures. In other words, the divergent validity of the model is adequate.

Table 2.
Divergent Validity Matrix by Fornell and Larcker Methods

Variables	Green managerial thinking	Green Innovation Management	Green human resource management	Green supply chain management	Technology management and environmental
Green managerial thinking	**0.885**				
Green Innovation Management	0.514	**0.891**			
Green human resource management	0.515	0.432	**0.923**		
Green supply chain management	0.494	0.521	0.681	**0.878**	
Technology management and environmental management system	0.480	0.518	0.436	0.536	**0.860**

Findings

To analyze the data collected in the data-based technique, it is necessary to perform the steps of open coding, axial coding, and selective coding to finally provide a logical paradigm or an objective picture of the generated

theory. It is worth mentioning that in this study, MAXQDA 2020 software was used to report the code format. In the first stage of the research, to summarize the components of management models with a green approach, library documents including books, articles, and dissertations related to research were referred to and researched, which was the result of this stage of extracting concepts. After repeated review and review of the researcher and supervisor after summarizing and summarizing the concepts, a total of 33 concept codes were identified that were considered as open reading codes before the interviews. In the second phase of data collection of the present study and to extract more concepts, the interview method was used. The demographic characteristics of the interviewees in the food industry show that among the 24 samples studied, 22 were male and 2 were female. In terms of age, 10 people were between 30-40 years old, 12 people were between 40-50 years old and 2 people were between 50-60 years old. In terms of work experience, 4 people were under 10 years old, 14 people were between 10-20 years old and 6 people were over 20 years old. In terms of educational status, 8 people had a master's degree, 14 people had a bachelor's degree and 2 people had a doctorate. In terms of job level, 10 people were experts and 14 people were responsible.

Open Coding

In this type of coding, concepts within interviews and documents are classified based on their relationship to similar topics (Strauss and Corbin, 1998). Following the implementation of the second phase of this study, to perform open coding of the text of the interviews, the line-by-line analysis method of the interview texts was used. In this method, the data were analyzed paragraph by paragraph or word by word. In this way, open coding was done by writing the extracted concepts in the margins of the interview

text. The text of the interviews was also included in MAXQDA software, in which 43 concept codes were extracted. With the completion of data conceptualization, similar concepts were grouped into a specific category. A total of 76 codes were identified by combining the concepts extracted from the two stages (library studies and interviews). From the extracted codes, after combining similarities and eliminating duplicate concepts, 70 new coded concepts were identified.

Selective Coding

At this stage, the data or concept codes were categorized into sub-categories and main categories using analytical notes. In fact, the process of linking categories to sub-categories is called selective coding. The main theory is discussed and the main categories have more explanatory power than the subcategories and concept codes. The following tables show the final results of the selective coding of the components in the present study.

Table 3.

Forming the Main Classes of Theory in the Process of Coding Conceptual, Sub-categories and Main Categories ***(Causal Conditions)***

Conceptual codes	**Subcategories**	**The main categories**
Creating quality control loops Increase the quality of the green product by attracting specialists and experts Establishment of research and development unit	Green performance of human resource management	**Green human resource management**
Use environmentally friendly materials in product packaging and further sales Increase environmental responsibility for greater profitability Determining the criteria and criteria for increasing product quality for profitability Paying attention to the health of consumers by increasing the quality of products	Green productivity management	
Empowerment and skills of employees in relation to		

environmental protection Increase knowledge in terms of relevant environmental laws Formation of internal environmental network and online environmental database	Creating green knowledge and skills
Recruitment and recruitment based on environmental criteria Include environmental requirements in the job description Education for environmental issues Provide the necessary green training	Hiring green staff

Table 4.

Forming the Main Classes of Theory in the Process of Coding Conceptual, Sub-categories and Main Categories ***(Strategies)***

Conceptual codes	**Subcategories**	**The main categories**
Development of new processes for better quality Use of green knowledge in the production process Redesign production processes to achieve higher quality	Green process innovation	**Green Innovation Management**
Green equipment and machinery Application of advanced green technologies Development of new solutions for the maintenance of goods Save on materials and manage documents	Green technological innovation	
Successful implementation of ISO 14000 series of standards Continuous improvement of green quality Development and implementation of green projects	Green management innovation	

Table 5.

Forming the Main Classes of Theory in the Process of Coding Conceptual, Sub-categories and Main Categories (Interfering Conditions)

Conceptual codes	Subcategories	The main categories
Green energy supply Providing infrastructure for the use of green energy Use of low energy equipment Use of renewable energy	energy supply	Technology management and environmental management system
Establishment of environmental management system and environmental audit Designing green criteria in evaluating employee performance Evaluate performance and reward based on environmental strategy Recovery and reuse of materials	environmental management system	
Creation and development of clean technology Establishment of control systems and operation planning Preventing the release of harmful substances into the environment with technology Minimize waste and reuse it	Implementation of green technology and information	

Table 6.

Forming the Main Classes of Theory in the Process of Coding Conceptual, Sub-categories and Main Categories (Contextual Conditions)

Conceptual codes	Subcategories	The main categories
Learning from the environment and choosing the best green option Creating a new green vision for the company Identify the main opportunities and focus the company's resources in order to achieve green quality Creating opportunities from unmet green customer needs	Strategic thinking	Green managerial thinking

Conceptual codes	**Subcategories**	**The main categories**
Institutionalizing the culture of being green in the company The perceived advantage of green products by employees Educate employees that the company is green Choosing an active environmental strategy Develop the company's capabilities in creating a green competitive advantage	Green management strategy	
Analysis of feedback from the company environment regarding the quality and greenness of products Creating interaction between different units of the company for green quality Designing a green quality model in the company due to changes in products Systemic behavior for green quality acquisition Attention to the generalities and composition of components for green quality	Systemic thinking	

Table 7.

Forming the Main Classes of Theory in the Process of Coding Conceptual, Sub-categories and Main Categories (Consequences)

Conceptual codes	**Subcategories**	**The main categories**
Environmental friendliness of the production process Non-harmful constituents of the environment The harmfulness of its constituent elements for human healt Improving the quality and variety of products	Green product	**Green supply chain management**
Green warehousing Green shipping Green product logo on the packaging or products	Green distribution	
Transfer of environmental knowledge to consumers Informing consumers about green product production as well as its environmental benefits Inform consumers of the benefits of the product	Green promotion	

Conceptual codes	**Subcategories**	**The main categories**
Fair (reasonable) price Provide good value for money The environmental attractiveness of the product relative to its price	Green price	
Promoting a green lifestyle Advertising the company's environmental responsibility Advertising the company's environmental responsibility	Green marketing	
Product packaging and recyclability Pay attention to the constituent elements of raw materials and their effect on the environment at the time of purchase Add environmental aspects to purchasing metrics Culture building in increasing demand for green products	Green Purchase	

Axial coding, or category-centric, is a category on which other concepts and categories are set around. In this model, the central category (main phenomenon) is "green quality management", which was determined by selected experts in the field of food industry by presenting concepts, sub-categories and main categories. The following steps were taken to ensure the validity of the research: Adaptation by members: At this stage, some participants reviewed the final report, analysis process or categories obtained and provided their views in this regard. Peer review: At this stage, the supervisors and consultants and three PhD students reviewed the findings and presented their views. These conditions have led to the formation of a central phenomenon or category (green quality management) and include a set of features that affect and shape the main category. According to the obtained concepts, it can be said that the use of environmentally friendly materials, increasing the environmental responsibility of companies and

other issues such as paying attention to the criteria and criteria for increasing product quality and paying attention to consumer health lead to the formation of green quality management. . By presenting the concepts, sub-categories and main categories to the experts and selected individuals, the causal conditions were determined as follows: Green human resource management and its sub-components (greening the functional dimensions of human resource management, green productivity management and creating green knowledge and skills and Hiring green staff). There are conditions that strategies affect, and these conditions include a set of mediating variables. It should be noted that the intervention conditions are causal and general and are a kind of structural conditions that limit or facilitate the intervention of other factors. Experts in study, technology management and environmental management system and its sub-components (use of green energy, establishment of management system Environment and implementation of technology and green information) were selected as the intervening conditions of the present paradigm model. Strategies express behaviors, actions, and interactions and are influenced by intervening and contextual conditions. Selected experts selected green management innovation and its components (green process innovation, green technological innovation and green management innovation) as the strategies of the present paradigm model. Based on this, development of new processes for better quality, redesign of production processes to achieve higher quality, application of advanced green technologies, development of new solutions for storage of goods, saving material consumption and document management and use of green knowledge in The production process has been a determinant of strategy. The positive results of the strategies are known as the consequences of the model. Therefore, the selected experts chose green product production, green distribution, green distribution, green

promotion, green price, green marketing and green purchasing as the consequences of the paradigm model. In the present study, in order to evaluate the validity of the research, the methods of "research team triangulation", "long-term conflict and continuous observation", "selection of appropriate samples for simultaneous data collection and analysis" and "participant review" have been used (Strauss & Corbin, 1998). Research team triangulation includes 3 data consensus: Researchers' consensus and method consensus. In the present study, more than one observer, interviewer and analyst was used to reduce bias in data collection, reporting, coding and analysis, and information from sources. Various activities such as reviewing documents and interviews with various experts in this field. Finally, according to the findings of the qualitative part of the research, the green quality management model in the food industry was extracted and presented as Figure 1 below.

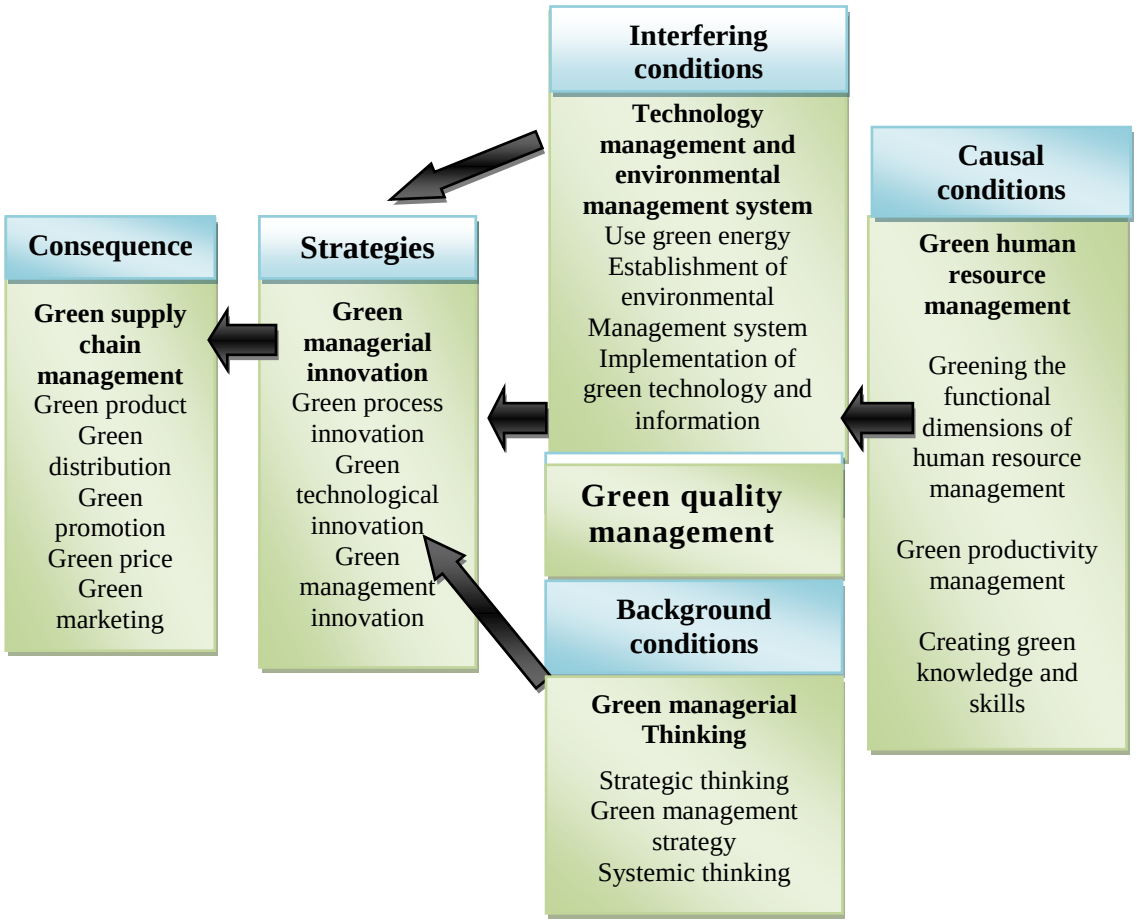


Figure 1. Green quality management model in the food industry

Inferential Findings: In this section, the factors extracted from the qualitative stage are examined and confirmed; to determine whether the model designed for green quality management in the food industry has the necessary credibility? Also, the relationships between the levels of the model proposed in the qualitative phase of the research through structural equation

modeling will be addressed. Findings of the research on the demographic characteristics of the statistical sample in the quantitative part show that 85.5% of the respondents are men and 14.5% of the respondents are women, also 27.18% under 30 years old, 46.82% between 31-40 years old, 17% Between 41-50 years and 9% of respondents were 51 years and older. The results showed that 3.24% of the respondents had a diploma, 9.15% had a master's degree, 51.6% had a bachelor's degree and 34% had a master's degree or higher. Also, 12.40% of the respondents had less than 5 years of experience, 47.6% had 6 to 10 years. , 33% of 11 to 15 years and 7% of respondents 15 years and older had work experience. To test the conceptual model of the research, PLS can be used, which is a variance-based path modeling technique. This method allows access to the relationships of hidden variables and visible variables simultaneously. This method when the sample size is small or the distribution of variables is normal. Not used in the PLS approach, the two models are tested. The external model is similar to the CFA measurement and the internal model is similar to the path analysis in the structural equation models. After testing the external model, it is necessary to provide an internal model that shows the relationship between the latent variables of the research. Using the internal model, the research hypotheses of the model can be examined. Also, the research variables were examined at the significance level of Kolmogorov-Smirnov test, in which all indicators were less than 5%. As a result, it can be said that the research variables are not normal and smart pls software can be used to test the hypotheses. This method is done in three steps: A) Measurement model fit, b) Structural model fit, and c) Overall model fit (GOF). Three criteria of reliability, convergent validity and divergent validity are used to evaluate the fit of measurement models. Reliability is achieved by examining the factor

load coefficients, Cronbach's alpha coefficients, and combined reliability, which are shown in Table 8.

Table 8.
Fits of Research Measurement Model

ASV	MSV	CR	AVE	Factor loads	Symbol	Subcategories	The main categories
0.01	0.05	0.86	0.51	.76	Q1	Strategic thinking	**Green managerial Thinking**
				.72	Q2	Green management strategy	
				.77	Q3	Systemic thinking	
0.02	0.01	0.83	0.54	.92	Q4	Green process innovation	**Green managerial innovation**
				.83	Q5	Green technological innovation	
				.74	Q6	Green management innovation	
0.001	0.03	0.94	0.58	.79	Q7	Greening the functional dimensions of human resource management	**Green human resource management**
				.85	Q8	Green productivity management	
				.73	Q9	Creating green knowledge and skills	
				.75	Q10	Hiring green staff	
0.01	0.04	0.86	0.52	.80	Q11	Green product	**Green supply chain management**
				.82	Q12	Green distribution	
				.84	Q13	Green promotion	
				.76	Q14	Green price	
				.82	Q15	Green marketing	
				.89	Q16	Green Purchase	
				.86	Q17	Use green energy	**Technology**

0.001	0.02	0.81	0.55	.84	Q18	Establishment of environmental management system	**management and environmental management system**
				.87	Q19	Implementation of green technology and information	

Since each structure consists of a number of questions that are a visible variable, high values show the amount of factor loads of questions related to each variable that is a structure so that the amount of factor loads of each question is less than 0.3 is removed from the structure. Here all operating loads are greater than the 0.5 level. In line with the objectives of the research, 5 hypotheses were developed and tested in accordance with the components of the qualitative model based on the data theory of the foundation. Accordingly, the hypotheses formulated are as follows:

Hypothesis 1. Causal variables have a positive and significant effect on green quality management.

Hypothesis 2. Green quality management has a positive and significant effect on the adoption of model strategies.

Hypothesis 3. The contextual conditions involved in the decision-making of model strategies have a positive and significant effect.

Hypothesis 4. Interventional conditions have a positive and significant effect on the adoption of model strategies.

Hypothesis 5. Green quality management strategies have a positive and significant effect on the consequences of its implementation. After compiling the foundation data theory model, a questionnaire was designed based on the obtained model and then to finalize the conceptual model and determine the coefficients of each of them using the structural equation model. The research hypotheses were tested by analyzing structural equations based on the partial least squares approach using

Smart PLS software version 2. Figure 2 shows the fitted structural model (in the case of significant coefficients of t-numbers), and Figure 3 also shows the fitted structural model in the case of standard coefficients.

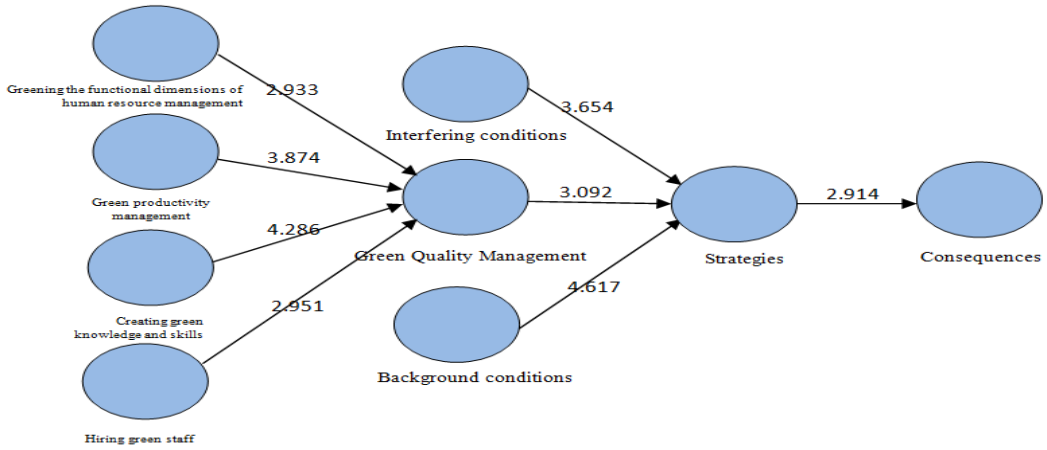


Figure 2. Fitted structural management (in the case of significant t-value)

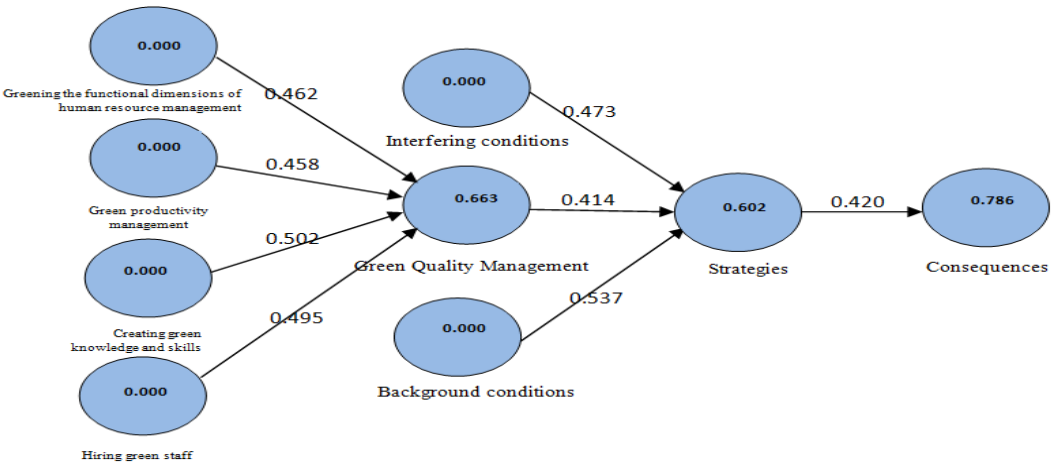


Figure 3. Fitted structural model (in standard case of standard coefficient)

Table 9.
Analysis of the Path of the Effects of Research Structures in Order to Test the Model

R 2	Result	P	t- values	Path coefficient	Affected variables	Effective variables
0.663	acceptation	0.001**	**2.933**	0.462	Green Quality Management	**Greening the functional dimensions of human resource management**
	acceptation	0.001**	**3.874**	0.458		**Green productivity management**
	acceptation	0.001**	**4.286**	0.502		**Creating green knowledge and skills**
	acceptation	0.001**	**2.951**	0.495		**Hiring green staff**
0.582	acceptation	0.001**	**3.654**	0.473	Strategies	**Interfering conditions**
	acceptation	0.001**	**3.902**	0.537		**Background conditions**
	acceptation	0.001**	**4.617**	0.414		Green Quality Management
0.686	acceptation	0.001**	**2.914**	0.420	Consequences	**Strategies**

** Significance less than one percent

According to the accuracy required to measure the research structures in this stage, the scientific relationship between the research structures is examined. The last step is to calculate the GOF value, according to the calculations, the mean values of Communality were 0.74 and the mean values of R2 were 0.495. According to the following formula, each GOF is equal to 0.650 obtained by Wetzels et al, (2009).

$$GOF = \sqrt{\text{average (Commonality)} \times \text{average } (R^2)}$$

Conclusion and Recommendations

The results showed that using the Corbin and Strauss method, 70 concepts, 19 sub-categories, and 5 main categories for green quality management were extracted so that in the conceptual model of the research, the main categories were: green quality management (central category), green human resource management (Causal conditions), Green management thinking (background conditions), Technology management and environmental management system (interventionist conditions), Green management innovation (green management strategies) and green product, Green distribution, Green promotion, Green price, Green marketing, and green purchasing Also (model implications). Structural equations and GOF criteria were used to validate the model. The value of R^2 related to the exogenous variables of green management thinking (0.63), green human resource management (0.66), technology management and environmental management system (0.61), and green management innovation (0.67) This indicates that the fit of the structural model is appropriate and the GOF criterion is higher than the level of fit classification based on the theory of Wetzels et al, (2009). As a result, it can be inferred that the present research model has a good fit and the variables of green management thinking, green supply chain management, green human resource management, technology management and environmental management system and green management innovation in designing green quality management model in industry Foods have a good fit. In the causal factors of the present study, the positive effect of organizational green culture on human resource performance was emphasized, so that Harouni and Razeghi (2020) in their research results have pointed out that TQM has a significant relationship with performance and the overall strength of organizational culture has a positive effect on It works. Results with the studies of Mazarezadeh (2015), Jabbour (2011),

Mustafa (2017), Abbaspour (2006) on optimal consumption, productivity, Haj Esfandiari (2015), Fayyazi (2015), Mousumi (2016) On the issue of environment, Nadafi et al. (2008), Jabbour (2011), Mustafa (2017), Abbaspour (2006), Mousumi (2016), Yu and Hue (2019), Khan (2015), Goswami and Ranjan (2015) on energy efficiency, energy-saving, energy efficiency, Nadafi et al. (2008), Khan (2015) on resource management, Yo and Hue (2016) on the use of renewable energy, Mousumi (2016) on the culture of green management, Jabbour (2011) on tactical green education. Renwick (2013) on the socialization of green values are consistent. Mathapati (2013) also confirms in his research that green human resources play an essential role in the organization to support environmental issues, which leads to higher efficiency, lower costs, and employee participation and retention. Green human resource management depends on identifiable and unique patterns of decision-making and green behavior of human resource managers. As Cherian et al, (2012) in their research entitled "Study of green human resources performance and its effective implementation in the organization" pointed to the role of managers and supervisors in the implementation of environmental programs and emphasized the role of human resources and the need for environmental education. Renwick (2013) in a study entitled "The effect of human resource management on environmental performance" have pointed to the role of education and selection and reward as factors in supporting organizational culture for better performance. Opatha (2013) in a study entitled "Green human resource management and sustainability" refers to the impact of green human resources in the recruitment process and green initiatives in creating an ethical and loyal environment that is effective in maintaining culture and reduces costs and increases profitability. Zhu and Sarkis (2010), Rafiei and Abdolmaleki (2017) have achieved similar results in their studies. On the

other hand, green supply chain strategies include two strategies of efficiency and accountability. A green supply chain with Indo combination, background of using green resources and energy, prevention of waste transportation, use of raw materials and environmentally friendly and reduction of pollution, reduction of waste, etc. and the benefits of green supply chain efficiency strategy reduces costs By creating innovation in the design and production of environmentally friendly and recyclable products, it reduces the costs of environmental degradation. As a result, the simultaneous combination of these two strategies will bring green quality to the company (Hassini et al., 2012). According to Chiou et al, (2011), green innovation can be a new process for product production _ or service delivery, a new management method or policy, or a new strategy for green quality that reduces environmental risks, pollution and the negative effects of energy consumption (e.g. Water, electricity) (Bergh et al., 2011). Software or hardware innovation in technology related to green products or processes such as energy-saving, waste recycling, green product design as a new perspective, idea, product, service, or process that seeks to reduce Negative environmental effects (Seman et al., 2012). Green management is a success factor of organizational and competitive strategies. In fact, according to the results of research done so far, the effect of green management on quality management is patient (Garzella and Fiorentino, 2014). As the results of the present study also confirm the role of this variable in the green quality model in the food industry. In general, it can be said that the conceptual model obtained through grounded theory has been approved and agreed upon by experts and can be used as a criterion for making tools in future research and also to green the quality management of the food industry. Based on the innovative results of the present study and the main categories extracted in the final model, the following suggestions are provided to managers and

organizational policymakers in the food industry, in order to achieve the objectives and correct implementation of green strategies:

• Empowerment and skills of employees to environmental protection and the inclusion of environmental requirements in the job description and design of green criteria in evaluating employee performance.

• Creating a new green landscape and institutionalizing green culture, as well as choosing an active environmental strategy in organizations.

• From green thinking and knowledge in the production process, application of advanced green technologies as well as implementation and development of green projects.

• Supply of products that are not harmful to the environment, creating a culture of increasing demand for green products.

• Supply of green energy and use of equipment with low energy consumption, recovery, and reuse of materials.

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