Developing A Conceptual Model For Social Manufacturing Paradigm Using Grounded Theory (Case Study: Furniture Industry)

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Abstract- The purpose of the present study is to provide paradigm pattern of social manufacturing in manufacturing businesses with case study of furniture industry. In terms of purpose, this study is fundamental and in terms of method, it is a descriptive-explorative study. For purpose of qualitative data collection, interview tool was used. Moreover, in line with doing the interviews, theoretical sampling was used and to design the social manufacturing pattern in furniture industry, grounded theory with theStrauss and Corbin approach was used. According to results of open and axial coding results, competitive factors, active customers, financial factors, institutional factors, behavioral factors, strategic factors and upstream institute instructions were obtained as the effective causal factors in social manufacturing pattern in furniture industry. Decentralized structure, partnership environment, social networks, network trainings, information communication technologies and research and development capacities are the main infrastructures required for social manufacturing pattern in furniture industry. Educational challenges, financing challenges, managerial weaknesses, motivational challenges, executive challenges of manufacturing, inadaptability with strategies and information weaknesses are the main factors interfering in social manufacturing in furniture industry. The results obtained from axial encoding of effective strategies in social manufacturing pattern in furniture industry showed that environmental monitoring, product commercialization, development of cooperative capacities, intellectual property of ideas, assessment of idea to product and development of networking can be categorized in this classification. Moreover, effectiveness of networks, organizational effectiveness and effectiveness of product competitive advantage are the main consequences of social manufacturing in furniture industry.

Key words: social manufacturing, furniture industry, grounded theory

I. INTRODUCTION

Over the years, development of competition in world level has conducted many companies with outsourcing approach towards centralizing on axial competencies and outsourcing activities relevant to value added of products to suppliers, so that they can pave the way for productivity and reduction of costs. The problem is that how one can achieve the most profitable portfolio on right time with the aim of realization of mutual advantages in frame of an appropriate structure (Ding, Jiang, Leng and Cao, 2015).

Nowadays, manufacturing companies in world level have gained high speed with increasing development of manufacturing technologies. In the paradigm of social manufacturing, manufacturing resources are utilized in a completely decentralized form and this is against traditional methods of manufacturing, in which all steps including design, manufacturing, assembly, sale and after-sale services used to be taken by a single company. companies are centralized on axial activities and tend to outsource many non-axial activities to other companies around the world, so that they can reduce investment in equipment, workforce and budget to gain more value added for services and to improve rapid reaction to dynamic market. In this field, manufacturing sectors become smaller and private over the time, as a result of which two factors of customization and outsourcing can become more effective than before (Ding, Jang and Zhang, 2013).

With the increasing enhancement of demands of customers for special products and modernism in furniture industry, active companies in this industry should meet the mass customization of the products and demands of consumers with rapid understanding of demands of customers. One of the most important challenges for the actors in this field can be the way of preventing waste of resources caused by lack of competitiveness and unfair competition. To solve these challenges, the cloud social manufacturing

framework for mass customization in furniture industry is presented. At the beginning of social manufacturing process, the major users have focus on architects, designers and fans; although in near future, all of them will need a new manufacturing mode and traditional companies will be changed into smart companies, which have ability to have active reaction and understanding against the special demands of many consumers and can meet mass customization using social manufacturing cloud service framework (Shang, Shen, Xiong, Wang, Liu, Timor, Wu and Guo, 2018).

Modern information communication technologies and manufacturing technologies have caused continuous changes in field of creation of value, special manufacturing, experience of partnership, manufacturing networks and so on. Based on the modern technologies, people can be manufacturer in networks and this can be regarded as a large virtual factory, which is managed by multiple beneficiaries in multidisciplinary, decentralized and local form and are sufficiently adaptable with manufacturing system strategy. Small workshops can cause technological empowerment in field of changing traditional manufacturing paradigm towards social manufacturing. They can enable every person to manufacture almost any kind of product, since they can present small manufacturing systems. To the date, small manufacturing workshops were less considered in realization of social sustainability, although with the advent of social manufacturing phenomenon, they can be regarded as an effective factor today (Basmer, conardi, krenz, redlich, wulfsberg and Bruhns, 2015).

Participation in social manufacturingcan provide more satisfaction of customers. In this field, customers gain more experience from the customization processes and present potential demands for other products and hence, customization can improve productions in future. In view of social manufacturers, social manufacturing can make the social manufacturing sources including small and medium firms, small factories, workshops and suppliers of supporting services and suppliers of public warehouses and form a society based on social media (Shang et al, 2018).

Growth of partnership of manufacturing sources can be realized through servicing conditions in industries such as furniture industry and growth of customization demand by the consumers. Many small and medium firms provide services of professional manufacturing for the manufacturers; although the main challenge is that disorganization of these companies can form barriers in the way of creating partnership space and negotiation with major suppliers of product. Network-based manufacturing is a good solution to create organizational relationship networks based on social manufacturing, which can meet the challenges. Accordingly,companies are classified based on organizational similarities in same manufacturing societies to pave the way for improvement of negotiation power, effective participation and analysis of manufacturing service industry. The major manufacturers choose the same level companies through the classifications to form the electronic manufacturing chain. In this case, relevant costs of partnership and cooperation are reduced (Ding et al, 2015).

The main problem in this study can be analyzed from this perspective that as furniture industry in Iran is one of the industries, in which customers have various demands and they have mostly customizing look at these products, it is significant to provide social manufacturing contexts in this industry. Innovation in this study is the use of grounded theory to design social manufacturing model in furniture industry. Due to emerging nature of social manufacturing paradigm, this issue has been neglected in domestic and foreign studies in field of manufacturing businesses.

II.   THEORETICAL FRAMEWORK AND LITERATURE

The social manufacturing phenomenonhas been spread widely in the world industries and has paved the way for fundamental evolutions in some industries. World economy networks have conducted governments and nations towards fundamental changes in manufacturing. In new manufacturing systems that happen in internet technology contexts and non-hierarchical structures, the customers and manufacturers cooperate with each other. This network, in which customers and manufacturers are placed alongside, is called social manufacturing. One of the understandable aspects of social manufacturing is its revolutionary aspect (Mohajeri, 2015).

Although the tendency of scholars for studying social manufacturing is increased, there are a few studies in this field to the date. In the studies in this field, social manufacturing has been studied from different points of view. For example, Cao and Jiang (2013) and Wang (2012) have studied social manufacturing in terms of calculations and services.Xiong, chen, shang and Nyberg (2013), Ding et al (2013), Mohajeri (2015),Leng, jiang, zhang and cao (2013) studied frameworks and structure of social manufacturing. Shang, su and liu and Mohajeri et al (2014) analyzed the consequences of social manufacturing in field of special industries such as 3-D printing and clothing. Recent studies in field of social manufacturing are focused on other affairs such as key techniques and empowerment business models in field of social manufacturing (Lang et al, 2015; Ding et al, 2015).Hamalainen, M., & Karjalainen (2016)have identified

existing gaps in previous studies and have found that social manufacturing is a pervasive, dynamic and comprehensive manufacturing paradigm. According to the studies conducted in field of social manufacturing, it could be mentioned that social manufacturing has the ability of unpredictable effectiveness in the environment (Poesche, mohajeri, kauranen, 2016).

In the social manufacturing paradigm, some actors such as small and medium businesses are smart workshops and a series of service supports, which form a social network, so that they can outsource manufacturing tasks. With the development of mobile internet and social network, the interaction and sharing data among them can be simplified. Contractual relations can be created between the manufacturer and the partners; although the relations of manufacturing chain are provided among provides of social manufacturing. The mode of social manufacturing can be considered as a evolved mode of the last state of multidisciplinary manufacturing (Shang et al, 2018).

In social manufacturing paradigm, manufacturing methods can be developed in line with needs of consumers. In this method, manufacturing can be integrated with open designing structures. This can improve innovation process, in which production of products of recreation can meet needs of consumers rapidly. The most important bases of social manufacturing can be structures of open design, along with innovation and cooperation of online societies in social networks, in which manufacturing resources cooperate to provide products (Ras, oosthuizen, durr, wet, burger and oberholzer, 2016).

Social manufacturing places many decentralized and social resources and different businesses in field of manufacturing a product in cooperative environment. This cancreate manufacturing societies through self-organization process. Capability of producing new knowledge can play considerable role in competitiveness (ibid).

Outsourcing manufacturing services in social manufacturing has conducted manufacturing organization from centralized state towards decentralization. In this regard, social manufacturing resources cooperate to develop final products. Hence, integrated manufacturing and evaluation of support services for the capability of close-loop quality tracking need increased effectiveness of process, on-time feedback of inventory and updated support. One of the most important units of multidisciplinary manufacturing is evaluation unit, which is changing constantly with change in orders of consumers (Ding and Jiang, 2015).

Social manufacturing includes important elements, which existence of each of them can make manufacturing process effective. Active customers, cyber-physical and social space, social interaction and participation and such issues can be placed in class of these elements. In rest of this section, each element is described.

1.   Active customer: active customer is a consumer, who participates in social manufacturing; meaning that active customer has dual role of manufacturer and consumer. Social manufacturing helps consumers to participate in lifecycle activities widely such as design and through self-organization mechanisms, outsourcing and social participation to obtain more special products and services.

2.   Cyber-physical-social space: includes human intelligences and social organizations (like groups and societies) and empowers social interactions and organic communications of active customers and social resources (like machinery tools, design software, measurement equipment and sensors) to customize products and services.

3.   Social interaction: this is a cognitive-individual difference, which is processed through action and reaction of active customers to each other and is described by means of individual needs or preferences (e.g. one of them is safer, more effective and easier) among customers. This factor is essential to create and protect the relations with active customers.

4.   Active customer communication: it is a real interactive cooperation among active customers, which is caused by adjusting demands and manufacturing capabilities and includes outsourcing (person to person or person to multiple active customers) and mass sourcing (person to a group of active customers) and various services (like design, machinery and product)

5.   Association in social manufacturing:a dynamic unit formed of active customers attached to each other, which are maintained with each other through common interests or with the aim of manufacturing a product and special service in order to meet a functional need or certain functional experience.

6.   Social field: can be considered as the mediator and result of social interaction and pervious operating events. This factor has been changed into a source for growth of association and participators using appropriate analysis techniques. Also, it can be a beginning point for improvement of decision making knowledge. for example, how one can enhance the performance or productivity of product based on the results obtained from field data (Jiang, Lang, Ding and Koren, 2016).

With review of theoretical framework and literature in field of social manufacturing in manufacturing businesses, the conceptual model (fig.1) is presented based on Grounded Theory andStrauss & Corbin approach:

Contexts and requirements
- **Decentralized manufacturing**
- **Partnership**
- **Cyber space**
- **Decreased hierarchy**
- **Social networks**

(Shang et al, 2018)

Results
- Reduce production costs
- Increase participation
- Internet production support
- Develop competitiveness
- Improving the effectiveness of industry transformation
- Economic Growth

(Shang et al, 2014)

Strategies
- Research and development and design manufacturing on time
- Decentralized procurement
- Cooperative Marketing
- Mass customization
- Comprehensive production of storage
- Network and virtual production
- Simultaneous engineering

(Mohajeri et al, 2016)

Major phenomenon

Social manufacturing in previous studies

Environmental factors
- Small and medium manufacturers
- workshops
- Small firms
- Manufacturing resources
- Large Companies
- Active customers

(ding et al, 2013)

Challenges
- Lack of manufacturing flexibility
- Challenges of customization effectiveness
- Weak internet infrastructures
- Domination of powerful brands
- Lack of on-time manufacturing
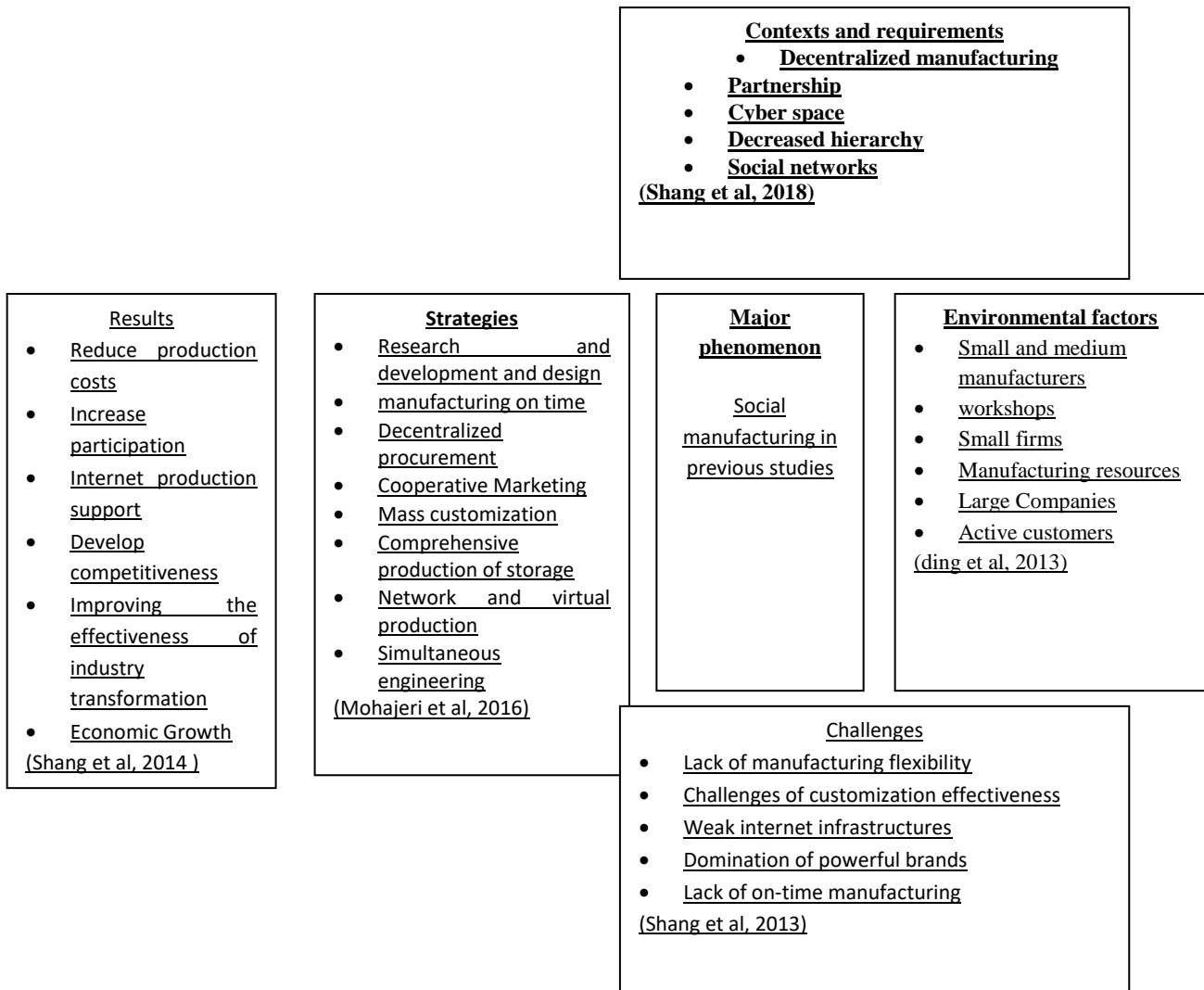
(Shang et al, 2013)

Figure 1: paradigm model of social manufacturing in manufacturing companies in previous studies (based on Strauss & Corbin approach)

One reason that the relations of categories are shown with flashes in the above schema is that in the studies in field of social manufacturing, no study has been conducted based on grounded theory. Hence, as the method in this study is the grounded theory with the Strauss & Corbin approach, to compare the results obtained from this study with previous studies, relevant factors of social manufacturing in previous studies have been placed in the framework of Strauss & Corbin approach.

Research questions
Main question:
- What are the factors of social manufacturing in furniture industry?
Secondary questions:
- What are causal factors affecting social manufacturing implementation in furniture industry?
- What are the conditions and fields required to implement social manufacturing in furniture industry?
- What are the challenges and problems with implementing social manufacturing in furniture industry?
- What are the required strategies to implement social manufacturing in furniture industry?
- What are the consequences of implementing social manufacturing in furniture industry?

III. METHODOLOGY

In terms of purpose, this study is a fundamental study and in terms of method, it is descriptive-exploratory research. Moreover, for purpose of data collection, qualitative method is used. In this approach,interview is used as data collection instrument and can provide qualitative data in order to analyze data-based theory. Figure 2 has shown the research layers based on Sanders Model. In this model, research method is analyzed from paradigm layer to data collection instrument.
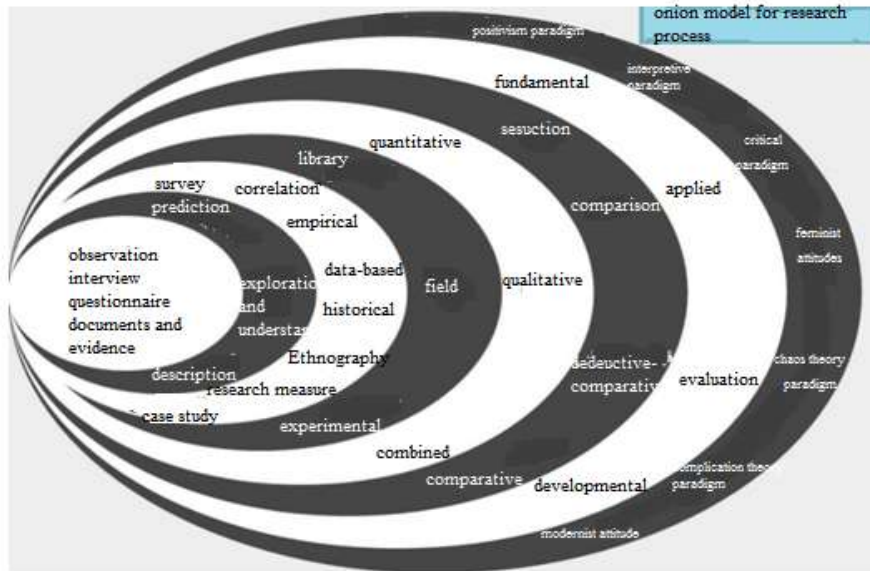

Figure 2: Sanders research layers (Danaeifard, Alvani and Azar, 2015)

Accordingly, the present study is placed in the layer of meta-positivism paradigm and interpretive paradigm. Moreover, this study can be considered as developmental research in terms of purpose. In terms of deductive or inductive nature, because of qualitative nature of research method, this study is deductive research. Moreover, this study has applied qualitative method, since it analyzes the qualitative data. In terms of collection of literature and specialized literatures, this is a library study and in terms of collection of qualitative data in certain population, this is a field study. On one hand, strategy used in this study is data-based theorizing, in which a subject is explored and understood. On the other hand, the instrument for collection of qualitative data in this study is interview.

The paradigm obtained from Grounded Theory with the Strauss & Corbin approach includes outputs such as causal factors, field factors, interfering factors, strategies and consequences. Figure 3 has shown the conceptual model derived from Grounded theory.
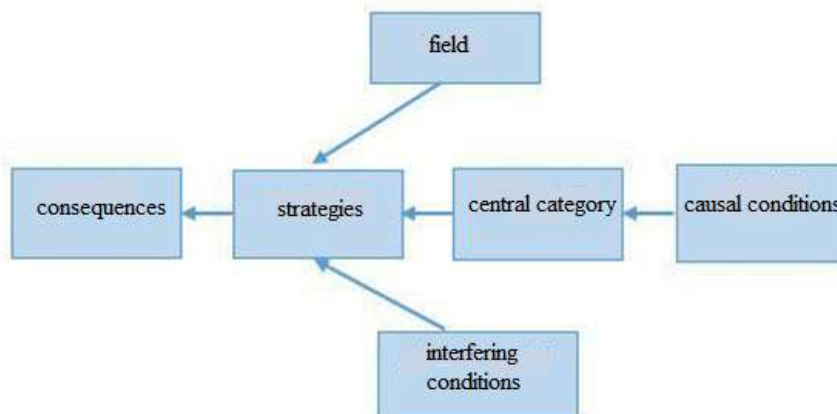

Figure 3: paradigm model of grounded theory with Strauss & Corbin approach (Danaeifard et al, 2015)

Accordingly, data-based theorizing can be considered as a transactional system, in which the researcher can test the nature with mutual relation of events. In this regard, the steps of grounded theory with theStrauss & Corbin approach can be classified in 3 steps including open encoding, axial and optional encoding.

Research participants
The research area is aimed at designing social manufacturing model in furniture industry. Moreover, the statistical population in this study consists of activists in furniture industry. The size of statistical sample in this study was specified through theoretical sampling method and the number of samples is determined to the extent that theoretical saturation is realized. Interviews are done with the experts with experience in field of furniture industry and those who are familiar with the concept of social manufacturing paradigm. Hence, number of participants in interviews was equal to 15 experts in field of furniture industry.

IV.   RESEARCH RESULTS

In order to provide deployment model of social manufacturing in furniture industry, grounded theory with Strauss & Corbin approach is used. Accordingly, the indicators of social manufacturing model in furniture industry are classified in levels of causal factors, field, interfering factors, strategies and consequences. The encoding method of qualitative data is in form of continuous data comparison.

Question 1: what are the causal factors affecting implementation of social manufacturing in furniture industry?
In the data-based theory based on Strauss & Corbin approach, causal factors are referred as thoseconcepts, which can affect interfering factors and consequences, strategies and field factors in frame of a series of identified codes. The first research question is aimed at analyzing the factors affecting implementation of social manufacturing in furniture industry. Code (A) is relevant to causal factors, which is defined from interviewer 1 (A1) to interviewer (A15). Moreover, the results obtained from open and axial coding are presented in table 1.

Table 1: results of open and axial encoding for causal factors affecting social manufacturing in furniture industry

Encoding	Open codes	Axial codes
A1	International free flows of goods and services	Competitive factors
A2	Free flows of factors of production	
A3	Competitive environment at home	
A2	Ratio of quality and cost over competitors	
A9	Increasing or decreasing the competitiveness of other manufacturers	
A14	Geographical Independence of Manufacturing Businesses to Provide Productive Factors (Decentralization)	
A8	Network relationships in customer interactions	Active customers
A7	Customer collaboration at product design stage	
A6	Social Business Environment	
A9	Customer Engagement in Product Marketing	
A9	Customer Engagement in Product Advertising	
A10	Determine how to finance	Financial factors
A11	Define product pricing policies	
A12	Determine the financial structure	
A12	Budgeting production costs	
A11	Determine the benefits of customer collaboration	
A8	Product pricing evaluation	
A8	Define dividend policies	
A8	Providing the necessary cultural mechanisms to implement social Manufacturing	Institutional factors
A7	Promoting Health in the Production and Marketing Space	
A7	Establishing and creating the conditions for the participation of active producers and customers	

A6	To institutionalize the culture of social Manufacturing in society	
A6	Managing ethnic and national cultural differences	Behavioral factors
A9	Cultural matching	
A9	Adaptation of systems and methods	
A10	Adaptive Human Resource Management	
A11	Complicating the synergies between production factors	
A11	Manage Partnerships	
A12	Team Building Management	
A12	Strategic compliance with the legal system	Strategic factors
A12	Applying accumulated managerial experiences	
A11	Application of micro and macro economics knowledge in planning	
A8	Designing a cohesion strategy	
A8	A thorough legal review	
A8	Build effective relationships with other organizations	
A7	Upstream financial support	Upstream institutes' instructions
A7	Upstream laws	
A6	Upstream partnerships	
A9	Financial and transparent rules on earnings	
A10	Organizational agility in upstream institutions	
A11	Funding to support social Manufacturing	

The results obtained from axial encoding of causal factors affecting social manufacturing in furniture industry showed that factors such as competitive factors, active customer, financial factors, institutional factors, behavioral factors, strategic factors and upstream institute instructions are the main causal factors affecting social manufacturing model in furniture industry.

Question 2: what are the conditions and fields needed to implement social manufacturing in furniture industry?
Field factors are the main causes and conditions, which encourage the activist to choose special behavior. Second research question tends to analyze the field factors and required infrastructures in social manufacturing model in furniture industry. Code (B) is relevant to field factors, which is defined from interviewer 1 (B1) to interviewer 15 (B15). The results obtained from open and axial coding are presented in table 2.

Table 2: results of open and axial coding of field factors of social manufacturing in furniture industry

Coding	Open codes	Axial codes
B1	Transfer or delegation of power and authority	Decentralized structure
B1	Participation in decision making	
B2	Power shift from center to circumference	
B3	Strengthening Organizational Democracy	
B4	Financial decentralization	
B3	Political decentralization	
B1	Decentralization of economy and industry (transfer of powers from high levels of government to social producers)	
B10	Effective communication between customers and manufacturers	Cooperation space
B2	Participatory spirit among managers	
B1	Internet channels for effective communication	
B12	Customer participation in production activities and organizations	
B7	Strengthen the culture of partnership	
B12	Supporting upstream entities in production participation platforms	

B1, B2	Sharing information and knowledge	
B3	The capacity to attract active customers in social networks	Social networks
B1	Quality of customer confidence and satisfaction in cyberspace	
B1	Quality of business information in virtual networks	
B1, B5	Customer buying behaviors in social networks	
B1, B9, B11	The quality of manufacturers' interactions with customers in cyberspace	
B3, B4, B5, B7	Communication channels in the social network between active customers and manufacturers	
B3, B8	Positive and Negative Impact of Virtual Media	Network trainings
B2	The Role of Social Media in Education	
B3, B5, B6, B7, B8, B10, B9	Teaching customers how to enter the production process	
B9	A network approach to information sharing	
B10	Participatory Management in Education	
B3, B9	Internet facilities for communication in cyberspace	Information communication technology
B4	Easy access to smart communication tools	
B6	Information and communication systems to receive ideas and provide feedback	
B8	Create virtual and online portals to receive customer suggestions	
B10	Creating communication networks to exchange information	
B12	Explore opportunities to create new and better structures	Research and development capacities
B8	Extensive programs in communication between factors of production	
B5	Applying external expert teams for research and development	
B6	Selecting multi-skilled staff with an aggressive spirit	
B4	Modify various administrative procedures of the HR system	
B7	Make necessary changes in the field of research and development	

The results obtained from axial codingof field factors of social manufacturing in furniture industry showed that decentralized structure, cooperation space, social networks, network trainings, information communication technology and research and development capacities are the main infrastructures required for social manufacturing in furniture industry.

Question 3: what are the challenges and problems with implementation of social manufacturing in furniture industry?
This section tends to analyze thechallenges and problems with social manufacturing in furniture industry. Code (C) is relevant to interfering factors, is defined from interviewer 1 (C1) to interviewer 15 (C15). The results obtained from open and axial coding of qualitative data collected to identify the challenges of social manufacturing in furniture industry are presented in table 3.

Table 3: results of open and axial coding for interfering factors in social manufacturing in furniture industry

Coding	Open codes	Axial codes
C1	Lack of support by managers for training systems	Educational challenges
C2	Lack of attention to the training of social producers	
C2	The negative role of the media	
C6	Structural Differences in Education	
C8	Low Priority Educational Systems	
C1	Weak financial resources	

C1	Lack of funds	Financing challenges
C4	Not having the same financial conditions	
C9	Financial problems	
C4	No identical conditions	
C10	Weak financial management	
C4	The poor have no priority	
C8	Payments inequality	
C5	Poor understanding of upstream managers	Managerial weaknesses
C5	Weak supervisors' awareness of implementation	
C7	Low awareness of corporate executives	
C8	Upstream managers' indifference	
C15	Poor awareness of the authorities	
C7	Resistance to change in social producers	
C3	The impetus of social producers	Motivational barriers
C3	Lack of attention to social producers	
C5	The insincerity of downstream managers	
C13	A Tool for Social Producers	
C6	Low anchors	
C7	Decreased anchors time and power	
C1	Fear Of Running	Executive challenges of manufacturing
C5	Impossibility of transformation	
C7	Organizations need not be involved	
C10	Waste of human resources	
C12	Problems with performance evaluation criteria	
C12	Poor Internet courses	
C15	Poor control of environmental factors	
C1	The weakness of all-round participation	Inadaptability with strategies
C2	Contrary to participatory production practices with property laws	
C3	The economic system contrasts with social Manufacturing	
C6	Heavy duty policy writing	
C6	Disorganization of organizations	
C8	Laws conflict with social Manufacturing strategies	
C3	Managers' Resistance to Learning	Information weaknesses
C6	Poor media literacy	
C6	Low awareness of problems	
C13	Low customer awareness of product design	
C10	Editors' unawareness of the current situation	

The results obtained from axial coding of interfering factors I social manufacturing in furniture industry showed that educational challenges, financing challenges, managerial weaknesses, motivational challenges, executive manufacturing challenges, inadaptability with strategies and information weaknesses are the main factors interfering in social manufacturing in furniture industry.

Question 4: what are the strategies needed to implement social manufacturing in furniture industry?
The question 4 of this study tends to analyze the social manufacturing strategies in furniture industry. Code (F) is relevant to strategies, which is defined from interviewer 1 (D1) to interviewer 15 (D15). The results obtained from open and axial coding of qualitative data collected with interview are presented in table 4.

Table 4: results of open and axial coding if effective strategies in social manufacturing in furniture industry

Coding	Open codes	Axial codes
F1	Ongoing Analysis of competitors' performance	Environmental monitoring
F2	Continuous modeling of leading companies	
F2	Speed of action in providing customer service to competitors	
F2	Identify ideas at different levels of the organization	

F3	Calling for ideas to attract ideas	
F8	Prevent dissemination of information outside the organization	
F1, F3	Designing a brainstorming system	
F1	Duplication of technologies	Product commercialization
F12	Intellectual Property Assignment Out	
F12	Outsourcing Knowledge and Technology	
F2	Integration and integration	
F1	Submit product to market	
F12	Creating a better business model to reach the market	
F5	Establish effective relationships with production organizations	Development of partnership capacities
F5	Customer participation in problem solving	
F6	Training and developing a culture of partnership	
F6	Strengthen the presence of active customers	
F1	Developing the capacity of the partnership space	
F4	Participatory decision making in product development	
F4	Open the boundaries of the organization	Networking development
F1	Methods of interaction and collaboration	
F8	Exchange of information and cooperation with universities	
F8	Inter-organizational network structure	
F2	Relying on working with outside-the-network partners in the form of networking	
F1	Financial evaluation of ideas	Evaluation of idea to product
F12	Technical evaluation of ideas	
F12	Using multilateral expert forces in project evaluation	
F12	Formation of ideas and projects evaluation teams	
F5	Evaluating the target markets of developed ideas	
F5	Using ideas evaluation teams in the implementation process	
F1	Value Added Evaluation of Implemented Projects	
F1	Valuing on outsourced ideas	
F1	Development of information and knowledge protection systems related to ideas	Intellectual property of ideas
F4	Formal and written contracts with customers	
F4	Intellectual Property Ideas	
F1	Follow up on copyright infringement registration ideas	

The results obtained from axial coding of effective strategies in social manufacturing in furniture industry showed that environmental monitoring, product commercialization, development of cooperative capacities, intellectual property o ideas and evaluation from idea to product and networking development are classified.

Question 5: what are the consequences of implementation of social manufacturing in furniture industry? The question 5 tends to analyze the consequences of social manufacturing in furniture industry. Code (E) is relevant to consequences, which is defined from interviewer 1 (E1) to interviewer 15 (E15). The results obtained from open and axial coding of qualitative data are presented in table 5.

Table 5: results of axial coding for consequences of social manufacturing in furniture industry

Coding	Open codes	Axial coding
E2	Development of communication channels between industry and university	Effectiveness of networks
E8	Attract more investors	
E11	Identify market and customer needs	
E12	Discovering and developing new markets	
E1	Strengthen communication channels with other companies	
E2	Provide access to existing channels and markets	
E2	Entering new channels and markets	
E3	Enhance participatory decision making in the organization	

E5	Increase managers' risk taking	Organizational effectiveness
E6	Reduce the amount of bureaucracy in the organization	
E13	Increase the power of organizational agility	
E3	Reduce the damage of bureaucracy	
E3	The dynamics of organizational culture	
E3	Completion and synergy in communication	
E4	Obtain operational, financial and human synergies	
E1	Increase competitiveness	Effectiveness of product competitive advantage
E2	Keep up with the latest technological changes	
E2	Geo-overlay with customers	
E4	Entering the field of new businesses	
E4	Development of product lines and markets	
E4	Overcoming interdependence in the environment	
E4	Acquire prestigious and powerful brand in the market	
E4	Develop and increase market share	
E4	Acquire prestigious and powerful brand in the market	

The results obtained from axial coding of consequences of social manufacturing in furniture industry have shown that effectiveness of networks, organizational effectiveness and effectiveness of competitive advantage are the main consequences of social manufacturing in furniture industry.

In the Strauss & Corbin approach, the main components of the model and their relation can be determined in axial coding. In this regard, choosing axial category based on content relation with other categories can be specified under causal conditions, field, interfering conditions, strategies and consequences. Based on Strauss & Corbin approach in grounded theory, the probable relations of categories can be specified and almost comprehensive understanding of social manufacturing in furniture industry can be obtained. Accordingly, the causal factors affecting main phenomenon, field factors and required contexts, interfering factors or the challenges of the phenomenon, strategies of implementation of social manufacturing and the consequences of getting these strategies are shown. Figure 4 has shown the paradigm model of social manufacturing in furniture industry.

Field factors
- **Decentralized structure**
- **Partnership space**
- **Social Networks**
- **ICT**
- **Research and development capacities**

Consequences
- **Effectiveness of networks**
- **Organizational effectiveness**
- **Advantage effectiveness**
- **Product competiveness**

Strategies
- **Environmental monitoring**
- **Product commercialization**
- **Development of cooperative capacities**
- **Networking development**
- **Evaluation of idea to product**
- **Intellectual property of ideas**
-

Main phenomenon
Comprehensive participation of manufacturing factors from the step of idea to product

Causal factors
- **Competitive factors**
- **Active customers**
- **Financial factors**
- **Institutional factors**
- **Behavioral factors**
- **Strategic factors**
- **Upstream institutes' instructions**

Interfering factors
- **Educational challenges**
- **Financing challenges**
- **Management weaknesses**
- **Motivational weaknesses**
- **Executive challenges of manufacturing**
- **Inadaptability with strategies**
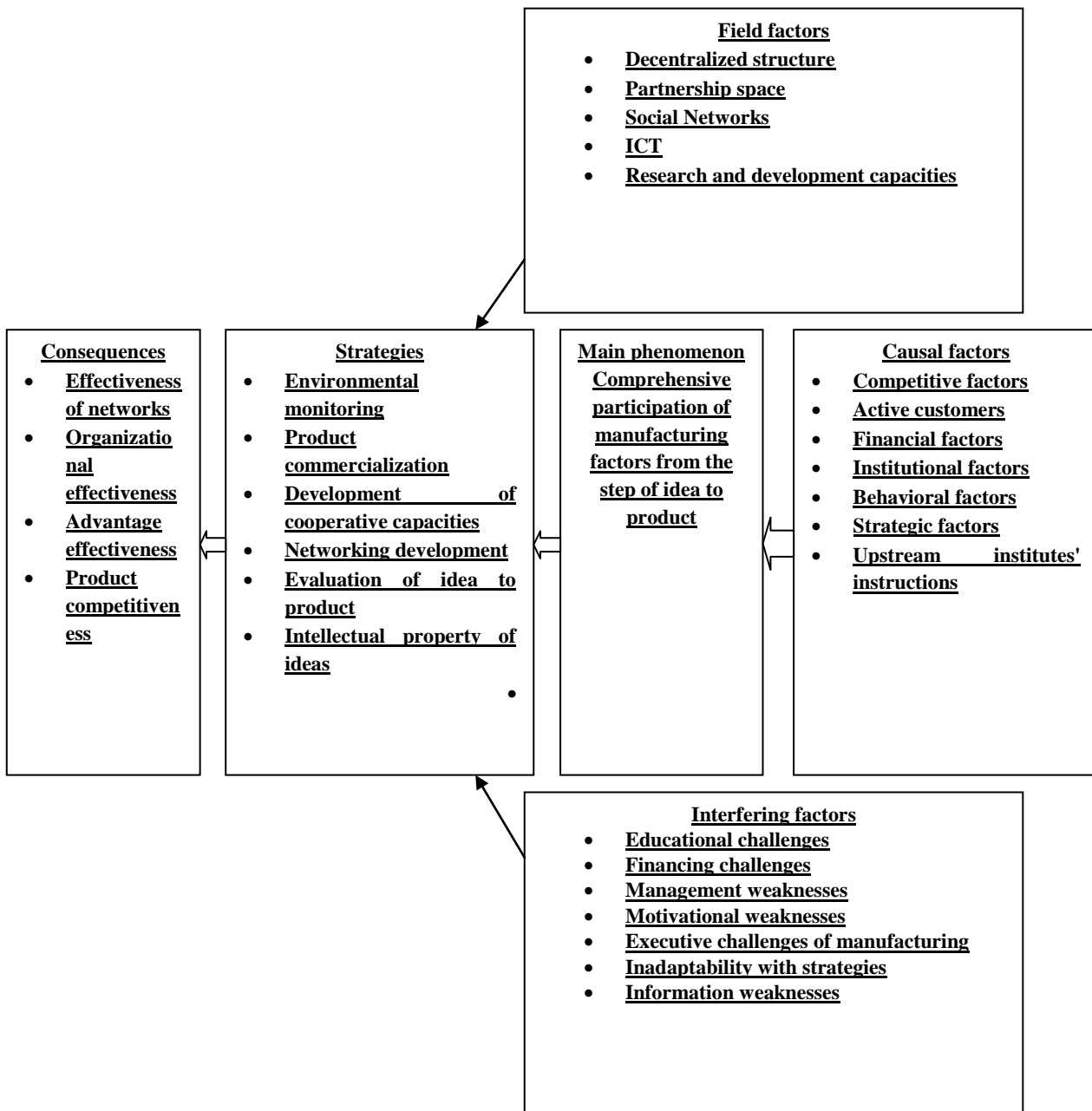- **Information weaknesses**

Figure 4: paradigm model of social manufacturing in furniture industry
s
As it is observed in paradigm model of Strauss and Corbin, causal factors, field factors, interfering factors, strategies and effective consequences of social manufacturing in furniture industry are derived.

V. DISCUSSION AND CONCLUSION

The emerging phenomenon of social manufacturing is changing the industries at the world. Development of world and network economy has madebusinesses to think beyond current manufacturing systems. In a modern manufacturing ecosystem that is equipped to internet, social networks and non-hierarchical organization; the customers and manufacturers in a network are connected to for common creation. This network, in which customers and manufacturers are connected, is called social manufacturing. Hence, in this study, with analysis of literature and review of the articles relevant to social manufacturing and using grounded theory of Strauss and Corbin, a conceptual model (fig.1) of social manufacturing in manufacturing businesses was presented.
Today,according to competitive nature of furniture industry, the importance of product customization in this industry and participation of customers in manufacturing process helps improvement of cost efficiency and increase in profitability of activists in this industry. Hence, the main purpose of this study is to provide model based on social manufacturing in furniture industry, according to which Strauss and Corbin approach is used to integrate and refine the theories. In this regard, during an integrated narration, description of relations of

categories is presented in levels of causal factors, field factors, interfering factors, strategies and consequences. Moreover, in this step,axial category of social manufacturing model in furniture industry is selected. To this end, the title "comprehensive participation of manufacturing factors from idea to product" was selected for optional coding, since it can provide good representation of whole study and relations of categories.

Hence, causal factors affecting comprehensive participation of manufacturing factors from idea to product include factors such as competitive factors, active customers, financial factors, institutional factors, behavioral factors, strategic factors and upstream institute instructions. These factors can directly affect the axial phenomenon in social manufacturing model in furniture industry. In comparison of results obtained from this study with previous studies, in the study conducted by Ding et al (2013), the category of active customers was identified, which is also referred in social manufacturing model in furniture industry.

On the other hand,in line with implementation of social manufacturing in furniture industry, there are challenges and barriers, which can cause problems with comprehensive participation of manufacturing factors from idea to product. The interfering factors can affect causal conditions and implementation strategies of social manufacturing in furniture industry. Interfering factors in social manufacturing in furniture industry include educational challenges, financing challenges, management weaknesses, motivational challenges, executive manufacturing challenges, inadaptability with strategies and information weaknesses. In comparison of results obtained from axial coding in section of interfering factors in this study with results of previous studies, it could be found that categories including inflexibility of manufacturing and customization effectiveness challenges in study of Shang et al (2013) and Jiang (2014) are in close relationship with the category of executive challenges of manufacturing in this study.

As it was mentioned, the challenges and barriers can also affect strategies of implementation of social manufacturing in furniture industry. The strategies include items such as environmental monitoring, product commercialization, development of cooperative capacities, intellectual property of ideas, and evaluation from idea to product and development of networking. In comparison of the results of this study with the results of previous studies, in the study conducted by Mohajeri (2016), the category of cooperative capacities is in consistence with cooperative marketing in previous studies and the issue of networking development is in consistence with network and virtual manufacturing in the study conducted by Mohajeri (2016).

On the other hand, requirements should be provided to implement social manufacturing in furniture industry, so that the way can be paved to make space for comprehensive participation of manufacturing factors from idea to product. These factorscan affect the implementation strategies of social manufacturing in furniture industry. Field factors affecting implementation strategies of social manufacturing in furniture industry include items such as decentralized structure, cooperation space, social networks, network trainings, ICT and research and development capacities. in comparison of the results obtained from this study with previous studies, the decentralized structure in this study is I consistence with decentralized manufacturing and decreased hierarchy; cooperative space is in consistence with cooperation capability and social networks in the study conducted by Shang et al (2018) and the ICT is in consistence with cyber space in previous studies.

On the other hand, the strategies of social manufacturing implementation in furniture industry can make some consequences, which pave the way for measurement of implementing social manufacturing in furniture industry in this organization. the consequence includes items including network effectiveness, organizational effectiveness and competitive advantage effectiveness of product. In comparison of results of axial coding in this study with previous studies, the issue of effectiveness of competitive advantage is in consistence with economic growth and development of competitiveness in study conducted by Shang et al (2014). Moreover, the issue of organizational effectiveness is in consistence with improvement of effectiveness of evolution of industries and decreased costs of manufacturing studied by Shang et al (2014).

REFERENCES

1. Danaei Fard, Hassan Alvani, Seyed Mehdi and Azar, Adel (2015), Qualitative Research Methodology in Management: A Comprehensive Approach. Tehran. Saffar Publications
2. Basmer, s., conardi, buxbaum., krenz, p., redlich, t., wulfsberg, p., bruhns, f. (2015). Open production: chances for social sustainability in manufacturing. 12th Global Conference on Sustainable Manufacturing.
3. Cao, and Jiang: Applied Mechanics and Materials(2012), Vols. 220-223 p. 61-64
4. Ding, kai and jiang, pingyu. (2018). Social sensors: a kind of hardware software integrated mediators for social manufacturing systems under mass individualization. Supported by National Natural Science Foundation of China (Grant Nos. 71571142, 51275396).
5. Ding, kai., jiang, pingyu., leng, jiewu., cao, wei. (2015). Modeling and analyzing of an enterprice relationship network in the context of social manufacturing. Institution of mechanical engineers. 1-18.

6. Ding, kai., jiang, pingyu., zhang, xi. (2013). A framwork for implementing social manufacturing system based on customized community space configuration and organization. Advanced material research. Vol: 712-715. 1-4.

7. Hamalainen, M., & Karjalainen, J. (2017). Social manufacturing: When the maker movement meets interfirm production networks. Business Horizons, 60(6), 795-805.

8. Jiang, pingyu., leng, jewu., ding, kai. (2016). Social manufacturing: a survey of the state of the art and future challenges. http://www.itrans24.com/landing1.html.

9. Jiang, pingyu., leng, jiewu., ding, kai., gu, peihua., koren, yoram. (2016). Social manufacturing as a sustainable paradigm for mass individualization. http://www.itrans24.com/landing1.html.

10. Leng, jiewu., jiang, pingyu., zhang, fuqiang., cao, wei. (2013). Framwork and key enabling technologies for social manufacturing. Applied mechanics and materials. Vol: 312. 1-5.

11. Mohajeri, B., Nyberg, T., Karjalainen, J., Tukiainen, T., Nelson, M., Shang, X., & Xiong, G. (2014, October). The impact of social manufacturing on the value chain model in the apparel industry. In Proceedings of 2014 IEEE International Conference on Service Operations and Logistics, and Informatics (pp. 378-381). Ieee.

12. Mohajeri, babak. (2015). Paradigm shift from current manufacturing to social manufacturing. Submitted in partial fulfillment of the requirements for the degree of Master of Science.

13. Poesche, jurgen., mohajeri, babak., kauranen, ilkka. (2016). Social manifactuirng principles in decentralization electricity generation. http://www.itrans24.com/landing1.html.

14. Ras, ci., oosthuizen, ga., durr, jfw., wet, de., burger, md., oberholzer, jf. (2016). Social manufacturing bamboo bikes for Africa. International Association for Management of Technology IAMOT 2016 Conference Proceedings.

15. Shang, xiuqin., shen, zhen., xiong, gang., wang, fei., liu, sheng., r, timor., wu, huaiyu., guo, chao. (2018). Moving from mass customization to social manufacturing: a footwear industry case study. International journal of computer integrated manufacturing. 1-13.

16. Shang, xiuqing., su, baoli., liu, xiwei. (2013). Social manufacture cloud mode in high end apparel footwear and hats. Proceeding of the 11th World Congress on Intelligent Control and Automation Shenyang, China, June 29 - July 4 2014.

17. Wang, F. Y.)2012(. "From Social Computing to Social Manufacturing: The Coming Industrial Revolution and New Frontier in Cyber-PhysicalSocial Space." Bulletin of Chinese Academy of Sciences 27 (6): 658–669

18. Xiong, gang., chen, yaran., shang, xiuqin., nyberg, timo. (2013). AHP fuzzy comprehensive method of supplier evalution in social manufacturing mode. Proceeding of the 11th World Congress on Intelligent Control and Automation Shenyang, China, June 29 - July 4 2014.