

**RANKING FACTORS AFFECTING THE INTEGRATION OF  
GOVERNMENT – UNIVERSITY–INDUSTRY TO  
IMPLEMENTATION CIM IN COOPERATIVES  
BY F-DEMATEL TECHNIQUE**

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**Abstract**

The strategic objective of all small and medium enterprises (SME's) ranging from cooperatives and Private companies, the continued presence in the realm of trade, growth and development, especially for profit. This feature was more prominent in production cooperatives and to survive they must constantly analyze their current dynamic environment. They must understand the changes correctly and to participate in today's competitive, productive systems that are needed to establish an efficient public transport system, inputs are processed at the lowest possible cost and with the best quality and minimum waste and less time in the output standard. Experience of industrialized countries, especially the United Kingdom indicates that the SMEs is equipped with computer integrated manufacturing (CIM) systems could achieve such an end. Given that all cooperative enterprises - in the SME definition – are SMEs; in comparative studies using this model for SME adoption of the country, the problem is most predictable is financial resources to implement the CIM that in collaboration government-industry-university and establish a stable relationship between these three elements can be used to solve this problem.

**Keyword(s):** *Computer integrated manufacturing (CIM); Small to medium enterprises (SMEs);  
Co-operative*

**INTRODUCTION**

Today, the presence of commerce, SMEs are seeking more effective and more competitive in all areas of marketing, product design, manufacturing robotics, computer manufacturing, group technology, computer control systems, transportation systems and in a word Computer Integrated Manufacturing. A growing number of cooperatives in industrial countries (especially England) selected or in their selection is different level of CIM as competitive strategy. CIM is a multi-layered and complex system that aims to integrate of points and islands of automation in manufacturing to increase the speed of response to changes in the

environment to produce minimum waste and maximum efficiency has been developed. In a world that becomes more and more competitive every day, the main competitive strategy of companies - especially cooperative companies in the world - the use of new technologies. In Islamic Republic of Iran (IRI) which all co-operatives (as one of the pillars of the economy, that the implementation of Article 44 of the constitution is more important) in SMEs are, with a series of comparative studies can choose this strategy to compete with the public and private sectors. Globalization of trade, economic development and growing to use the internet to interact and exchange data changed the rules of competition and economic efficiency in the cooperatives. CIM is the best tool for this change, especially for a new paradigm in cooperative production. Lefebvre et al. (1996) found that CIM is a concept for the integration of the automation that was started long ago and existed in manufacturing enterprises as points of automation (specialized software used in an section) or as islands of automation (software linked to each other in an organizational unit), and now they are linked together to create an computerized integrated manufacturing (CIM). In the mid-1970s, many European governments to accelerate their economic growth, supporting the SMEs in their agenda that based on their belief in the potential of the SMEs market to create jobs and prosperity of national, regional and global (Rothwell and Dodgson, 1992). What about does not exist in the Iranian cooperatives. In general, government policies play an important role in the establishment CIM facilities in cooperatives. Any change in government policy affects the cost of raw materials, electricity and gas supply and transportation facilities that are among the industry's infrastructure. Effect of financial and monetary policy on industrial growth is also specified. Governments can be help to cooperatives by financial and technological facilities supported to equipment with CIM. Deshmukh and Sambasivaro (1995) examined some of government policies affecting the CIM, the most important ones are as follows:

- ✓ Heavy fluctuations in monetary terms;
- ✓ Fluctuations in exchange rates;
- ✓ Tax policy and its impact on industry profitability;
- ✓ Supporting government policies.

Shabbir (1995) as well as some governmental support strategies of cooperatives are stated as follows:

- ✓ Remove regulatory constraints to accelerating the industrial development of the SME's (Cooperatives);
- ✓ Facilitate the allocation of financial resources and the maturity of the appropriate interval;
- ✓ Determine tax incentives for SME's (cooperatives);
- ✓ Technology development strategy in the SME's (cooperatives).

The role of universities should also mention the importance of the relationship between universities and cooperatives in implementing CIM. A competitive environment is created in cooperatives by providing cooperation with universities in technology research which are recorded in the cooperative's name who have participated in the project and they can take advantage of copyright relating to it. The importance of the relationship between industry and universities on the establishment of CIM is an issue that has been highlighted in a 1970 newsletter between industry and universities in the UK (Rothwell, 1991). Young and Vesterager (1990), developed a model for providing special solutions in CIM that called CIM / GMES. It was a joint effort between industry and universities in the field of 1) Development of the experimental system on CIM and 2) Exchange of information and experience in the equipment and methods of CIM.

According to Biondo et al (1995), cooperatives in industrialized countries - especially UK - are interested in developing cooperation with universities in innovative processes and tend to be informed the real development of needed for each area (the contingency), which leads to

better progress and direction of research and training. Many businesses, especially cooperatives in Iran still do not know what is CIM and universities that they must be introducing a possibility of integration in manufacturing software. In industrialized countries, CIM came from enterprises to universities and collaboration will accelerate the development of the CIM. But in Iran, the mission of introducing the CIM in the industry is responsible for universities. Vaux et al. (1996) presented a model based enterprises associated with the University and of course, insisted that the enterprises for success, to be red lines for themselves, society, universities and advanced research to defined in terms of interactions exist.

According to what was said, in this paper we study the role of cooperatives in the world, Importance of the relationship between industry, government and universities on the establishment of a more successful CIM equipment described. For this purpose, according to research from other countries, identify factors and most important of them were selected. Then with questionnaire of government - industry and academia experts, we determined the interactive relationship between these factors. For knowing which factor is more important than another until more work to be done on these factors, the multi-criteria decision making techniques are used. Due to the influence of selected factors on each other, and definite lack of response for qualitative variables, F-DEMATEL technique were used.

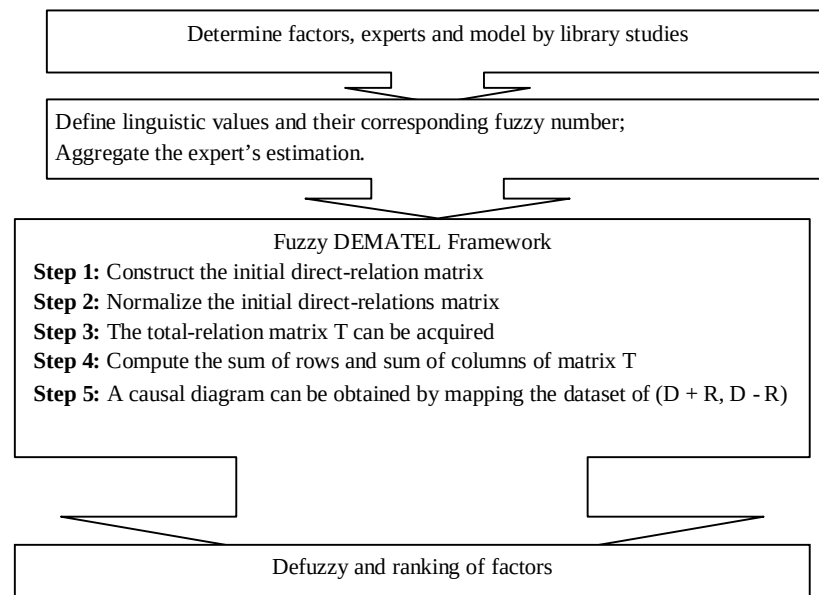


Figure (1): Research design

## LITERATURE REVIEW

Este and Patel (2007) based on the analysis of the experimental system find that the most SMEs deficient the government support and incentives to equip the CIM. Hence the need in a given time period, with the necessary financing in the form of low interest loans to encourage SMEs participation in the market for a new act.

Rothaermel and Thursby (2005) found that most SMEs have not suitable Computer Networking Equipment for implementation of CIM. Networking, in addition to the implementation of CIM in the enterprise makes communication easier, thus concluding strategic alliances to improve the overall form of the production technology; This has resulted in direct collaboration in place with low cost mutual strategic alliances, professional counseling networks, academic research networks, direct cooperation between technology

centers, local area networks (LAN) and wide-bandwidth networking to connect to the network others will.

Mongkhonvanit (2008) in his doctoral thesis concluded that the lack of evidence collaboration with universities, while for the success of the implementation of CIM, SMEs must be associated with universities in different cases, such as: Short-term employee training, seminars and working groups for detailed CIM industry leaders and academic facilities to the idea of making use of and access to new technologies in order to compete better, use faculty members as the Supreme consultants, use this specialist consultants and elected to solve specific problems, the other party to gain seats employee stock investment in the SME staff and faculty.

Ankrah et al (2007) in the investigations, including the failure to equip SMEs equipped with CIM has been noted in these cases. Lack of effective support systems, lack of appropriate program for integration of enterprise high-level systems and lack of link this automation sensitive islands together, lack of experience and lack of scientific information on new technologies, according to the reasons for the need to integrated and flexible systems, is the basic requirement to equip CIM.

Leydesdorff (2012) in universities and industries tend to develop a practical CIM hasn't been observed. In the present investigation, this is due to the lack of appropriate expertise in this area. CIM professionals who are enthusiastic about the work, both in academia and in industry, little and few, but the need to change the industry, especially the SMEs are critical. So it has been suggested that government form a work-group of university professors and industrial experts. Responsibility for CIM projects development planning in the SMEs will be for this government- industrial-university collaboration. Organize such exchanges certainly will be effective accelerate the speed of diffusion CIM technology in the SMEs.

Duderstadt (2005) studies indicate that both the government and industry must effort to support research projects related to the implementation of CIM in the SMEs. However, there is still debate about how universities operate. Some people believe that academic research should serve the interests and needs further industrial real and shall then require the industry to submit their research projects. According to these scholars, if not academic research with industrial users, would be meaningless. In contrast, others argue that experts understand what is best for the community and industry, and industry must be a follower of the academic and theoretical results. Scientists and university professors are in your room thinking then the industry that must be followed to the commercial value of their ideas and coordinate with your thoughts. In any case, the University will have a major role in the successful implementation of CIM, whether it's design and how the industry is needed.

Edmondson (2012) said that one of the issues raised in the CIM is the use of global languages. The CIM components should be evaluated by an international network of computers can be linked together. This is the area where the SMEs had little experience and academic resources to get help. CIM is an global project that requires international cooperation as well.

Miller (2009) found that implementation of CIM is strategic and sensitive. Responsibility of CIM implementation in the SMEs is top-managers afford. For this reason, managers should be looking academic perspective and realize that the success of projects in collaboration government and university are possible. The relationship between companies research and development (R&D) with CIM, research suggests that many of the companies have less than 10% of your total net profit is spent on R & D, while for new technologies , R & D staff in companies that are considered the best and least expensive sources. Researchers working within companies, needs to be better known and better ways to meet the needs of foreign researchers can achieve. If R & D in companies with university resources to be integrated and also get support from government then success is guaranteed in the implementation of CIM.

Park and Leydesdorff (2010) studies indicate that lack of communication between the SME in which CIM was also evident. This lack of communication hinders SME employees to share their experiences with one another. Employees must understand the principles, capabilities, goals and objectives of CIM to be successfully implemented in the SMEs. Staff training is essential that universities and empirical connections between the SME is possible and international networking among SMEs is required for this job.

Krippendorff (2009) studies indicate that training and education is an important component in SME technology transfer. Shortage of skilled labor and facilities inside and outside the company are obvious. This situation with the corporate training seminars in order to achieve the latest CIM will be better. These seminars should be conducted by universities and government support. These seminars should be conducted by universities and government support. Workforce is the backbone of any company. To motivate them, top-management should consider appropriate incentives when implementing CIM. Incentives such as medical care, vacations, insurance, pensions, pay the full cost of illness, entrusting decisions and extra payments.

### **COMPUTER INTEGRATED MANUFACTURING**

Computer-integrated manufacturing (CIM) is the manufacturing approach of using computers to control the entire production process. This integration allows individual processes to exchange information with each other and initiate actions. Through the integration of computers, manufacturing can be faster and less error-prone, although the main advantage is the ability to create automated manufacturing processes. Typically CIM relies on closed-loop control processes, based on real-time input from sensors. It is also known as flexible design and manufacturing. The term "computer-integrated manufacturing" is both a method of manufacturing and the name of a computer-automated system in which individual engineering, production, marketing, and support functions of a manufacturing enterprise are organized. In a CIM system functional areas such as design, analysis, planning, purchasing, cost accounting, inventory control, and distribution are linked through the computer with factory floor functions such as materials handling and management, providing direct control and monitoring of all the operations. CIM is most useful where a high level of ICT is used in the company or facility, such as CAD/CAM systems, the availability of process planning and its data (Bruce, Daly and Towers, 2004).

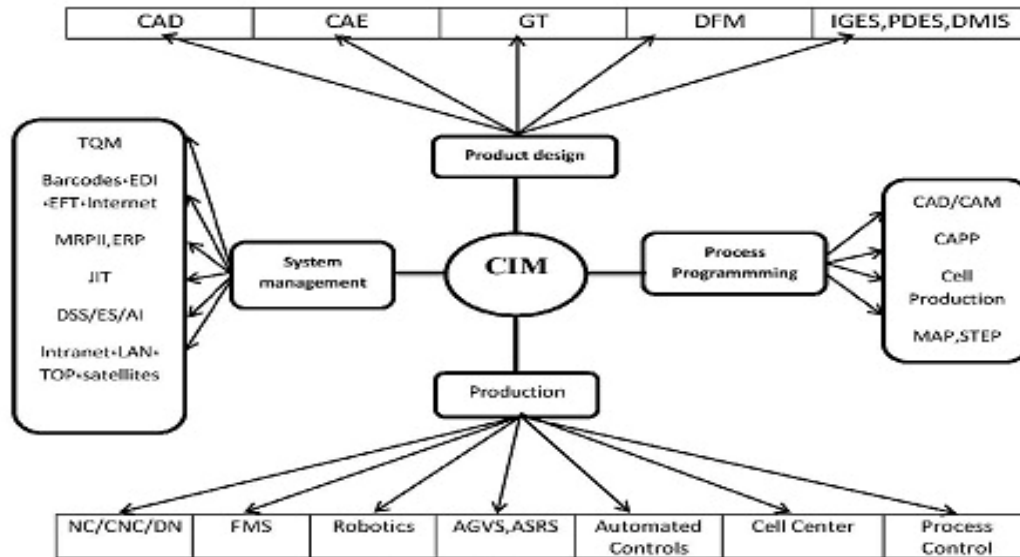


Figure (2): CIM Components (Jafarnejad, 2010)

CIM concept with the concept of fast responsive organization (FRO), Computer Integrated Business (CIB) and the Extended Enterprise (EE) is tied. The role of production management system (PMS) in CIM is the main role. In view of PMS is an executable activity that requires continuous effort. The concept of production is including a range of activities in a broad range of industry sectors and different types of companies. Expression profile status and latest methods of production to the overall shape is very difficult. For this reason, we must distinguish between what the term "status" in the universities and industrial research laboratories and what it meant to be understood distinction in various industrial sectors. Moreover, this last condition is also constantly changing; definition of CIM is still evolving and there are still the question remains whether or not the term CIM is the best word in this position?

CIM shows the application of computer integrated manufacturing facilities in order to achieve the objectives of the plant. The CIM does not a software or hardware, it is a concept for computer hardware and software that can linked together for design, manufacturing, maintenance, statistical quality control, and all matters related to production and services.

This article does not attempt to determine the structure and architecture of the CIM, rather to describe the government-industry-university collaboration on the successful implementation of CIM in Cooperatives. Those interested in a more technical topics related to the structure of CIM can Yeomans et al (1985), Harrington (1994), sheer (1998), research projects CIM OSA and other recent publications ESPRIT refer.

CIM seeks to achieve the kind of integration in discrete parts manufacturing. The integration process is already ongoing in many industries such as steel production and oil refining is obtained. The main motivation is the desire of humans to increase the automation of manufacturing systems to achieve higher productivity. Japanese competition has made greater efforts to achieve industrialized countries to take CIM. Continuous decrease in the cost of computer technology has also accelerated this process. Today you can see overlap and competition of the automation islands in the field of certain activities in the factory. For example, a production unit that is seeking to implement a system of Manufacturing Resource Planning (MRPII) and Automated Storage and Retrieval System (AS / RS), usually deals

with two different sellers. In addition, status of factory inventory can be controlled by either of the two systems, so there are two solutions to the users of the technology:

1. The relationship between these two systems is fairly well defined.
2. Import many data separately for each system.

Obviously, the use of both solution will increase the volume of effort and reduce the possibility of error. In fact, many computer systems can be viewed as islands of automation, because each of them have been developed separately to solve specific problems or to automate certain processes or procedures (Figure 2).

Create links between the islands of automation that are separately formed is always difficult and troublesome. Research programs in the field of CIM seek to partially solve this problem with the redesign of production system modules with integration attitude.

Authors such as Miller et al. (1986) have considered three types of integration: technical integration, procedural integration and integration of object. Technical integration makes electronic communication between different operational areas. These relationships have been developed in the context of communication channels, communication protocols and standards. Manufacturing Application protocol (MAP) and The Office protocol (TOP) has led to the integrated productive islands. For further study in these areas refer to Dwyer and Ioannou (1997). Procedures integration is achieved when the ruling is a uniform approach to the interpretation of data on various operational groups. As a result, this group - which exchange information between each other - will be able to use the same procedures and appropriate. Highest degree of integrity relates to consistency of purpose. The goal integration is achieved when the different operational areas (automation islands) use of the common data and information to achieve common goals. Thus, it appears that CIM - at least based on what was understood in the 1980s - including the integration of the various automation islands is incorporated in a Collection. Although definitions have been proposed for CIM but the general consensus has not been reached on the scope CIM. CIM is a concept that can be defined in any industry and guide the computerize facilities of them, this means that every branch of industry, in terms of experiences, needs and special occasions, provided special circumstances for CIM. Furthermore, it is clear that an industrial company is trying to achieve CIM, over plans for development has to consider their current investment in the automation islands so-called that "The legacy systems". Thus the existence of the above-mentioned conditions, which describes the CIM, depend heavily on the experience and views up to describe them.

### **SMALL AND MEDIUM BUSINESS (SME's)**

For small and medium enterprises no formal definition has been provided and accepted by the university. The SMEs definition used in different countries is very diverse and depends on the stage of economic development and social conditions prevailing in them. Although different criteria used to define SMEs such as number of employees, capital stock, assets size, number of sales and production capacity but most common criteria for defining these firms is employment levels. From this perspective, SMEs in special economic, is an entity that to be less than 500 employees. In some countries it is considered a basic figure of less than 300 or even 100 people. In some countries, the base is considered to be less than 300 or even 100 people. Definition of "European Institute of Statistics ", which is based on fewer than 250 employees that is accepted in 19 European countries, is the most widely accepted definition. Although several countries have used the same criteria for defining SME's, but may be provided different categories of it in different countries. For example, a medium-sized Canadian firm in Australia is medium firm. While in Hong Kong and China, the firm is classified as large firms.

Like other countries, the co-operatives can be very large, but in Iran they are in the small and medium units. As SME's, cooperatives are special entities that are heterogeneous in terms of the nature and extent of direct or indirect participation in significant national production, employment and labor absorption. On the other hand cooperatives play an important role in relation to the uptake of profits for shareholders and a more equitable distribution of income among them. It is estimated that cooperatives account for 90 percent of economic units and hold more than 50% of the workforce employed in different countries.

Based on a classification, small and medium enterprises are divided into the following four groups:

- 1) Micro enterprises: with 1 to 4 employees.
- 2) Very small enterprises: with 5 to 19 employees.
- 3) Small: 20 to 99 employees.
- 4) Medium-sized enterprises with 100 to 500 employees.

### **GOVERNMENT – INDUSTRY – UNIVERSITY COLLABORATION**

Jaikumar and Hyes (1999) in their research stated that the use of current vertical information structures, difficult to establish a mechanism for sharing information and skills to deploy advanced computerized manufacturing systems (CIM) and In the first step it is necessary to re-engineer the flow of information. Zammuto and O'conner (2002) Concluded that flexible based systems on the control based systems are more prepared for the CIM. Studies conducted by Cromie (1991) and Smallbone (1991), introduces lack of capital the common problem of Startup companies to run of CIM. Kellock (1993) research confirms that in 23 percent of the surveyed SME's, lack of capital is main problem. It also has a newsletter with about 60% SME's in UK, investments have done over his credit; This reflects a general lack of long-term investments in the sector. Co-operatives in Iran has not been fitted to the islands of automation, which require substantial investments and certainly these investments are not possible without government support. It must not ignore the world SMEs experience indicates that these types of investments is answered and SME's development in the 1980s led to this country's economic growth and development (2001 and Rothwell). Organization for Economic Cooperation and Development countries (OECD), has implemented plans to SME's development and transfer of CIM's technology scientific information. It is worth noting that state aid in the transfer of information technology can be several typs, such as direct or indirect, short-term or medium-term and long-term, occasional or no interruption, even may be focused on the SME or large companies and research institutions will also be included (Marri et al., 1998).

Although the authors have found it necessary government support for successful implementation of CIM in SME's, but Raymond and his team (1996) stated that public agencies and governments supports with programs such as the allocation of loans and cut taxes in most European countries, especially UK companies are not required. Even said that the founders of the company are generally not a good idea for government intervention in the work of government programs and, ultimately, know a very complex administrative.

Vonorta and Xue (1997 ) concluded that the role of governments to support the SMEs to the CIM facilities, In addition to loans and tax breaks, should be to create artificial markets for SME products inside and outside. Keeble (1992) raised this criticism of government support in Europe and America that Justice is not observed in the distribution of support and denied rural enterprises from the public service. Storey ( 1993 ), Devins and kimbara ( 1995 ), Goss ( 2001 ), Pattor and Bradley ( 2005 ) all were critical of government support in this area. In contrast, Senker (2004), jone and Beckinsdale (2004) and Tiler and Gibbons (2005) reported strong analytical papers which state support for the establishment of CIM in SMEs as an

inevitable and necessary whereas the success of the plan depended on government support vigorously.

About the universities and their relation to the SMEs, It can be said that the networking between them will play an important role in equipping the SMEs to CIM. It is important to note that the SMEs in comparison with large industrial companies which are equipped with update and expensive laboratory equipment and R & D units, they are more dependent on university resources about technology and scientific information. It should also be noted that whatever be companies smaller, seek practical and concrete ways to compete, survive and be profitable than to create academic reputation; and in this respect are fundamental differences with the universities. As well as discussion of copyright and maintain the safety of personal information are important constraints including universities and SME collaboration (Henry et al, 1997). Estime et al (2003) also pointed out the obstacles to collaboration. Unfortunately none of these researchers were the solution for problem. By examining the SMEs networks Compared to national and international networks and SMEs unique scientific and technological information, offered a solution to overcome communication barriers universities and SME's and the use of a "third factor" or middleman instead of direct communication and interactive. Obtain a better understanding of the SME's network enhance the effectiveness of these networks and to promote SMEs competitiveness and networks maintenance, there is no choice but to cross the universities road. Alles (2001) introduced the science and technology parks as by universities and SME's, as the two stages of technology transfer by the universities. He introduced the two stages of technology transfer by the universities:

1. Direct linking academic researchers with the SMEs he called it "non-Institutional technology transfer".
2. "Institutional technology" transfer as a result of direct contact with customers and universities is done. This type of relationship is that of taxation and copyright is not cost-effective and require the intermediate societies.

Bionde et al (2005) presented a model according to an intermediary agency, establishes a relationship between the SMEs and universities. The ultimate goal, selling academic research services and products and help SME's to improve their competitiveness. In addition, all academy and industry scholars, to optimal establish the CIM in SMEs emphasized the more relationship between SMEs and universities.

## FUZZY DEMATEL

Fuzzy DEMATEL technique is described in the following steps:

**Step 1:** Construct the initial direct-relation matrix. Identifying the decision goal and forming a committee of experts in order to evaluate the direct affect between each pair of elements. Generate the initial direct-relation matrix  $A = [a_{ij}]$  by converting linguistic assessment into the crisp value. The initial direct-relationship matrix is a  $(n \times m)$  matrix and  $a_{ij}$  represents a direct impact of factor  $i$  on factor  $j$  and when  $i = j$  the diagonal axis  $a_{ij} = 0$ .

**Step 2:** Normalize the initial direct-relations matrix. The normalized direct-relation matrix  $D = [d_{ij}]$  is calculated through Eq. (1). All elements of the matrix  $D$ , are between  $D$  and all the elements on the principal diagonal elements are equal to 0.

$$D = \frac{1}{\max_{0 \leq x \leq 1} \sum_{j=1}^n a_{ij}} A \quad (1)$$

**Step 3:** The total-relation matrix  $T$  can be acquired by using Eq. (2) in which  $I$  is an  $(n \times m)$  identity matrix. Each element in this matrix represents the indirect effect of a factor on the others. So, the matrix  $T$  can reflect the total relation between each pair of system factors.

$$T = D(I - D)^{-1} \quad (2)$$

**Step 4:** Compute the sum of rows and sum of columns of matrix  $T$  through the Eq. (3-4).

$$r_i = \sum_{1 \leq j \leq n} t_{ij} \quad (3)$$

$$c_i = \sum_{1 \leq i \leq n} t_{ij} \quad (4)$$

**Step 5:** A causal diagram can be obtained by mapping the dataset of  $(D + R, D - R)$ , where the horizontal axis  $(D + R)$  is made by adding  $D$  to  $R$  and the vertical axis  $(D - R)$  is made by subtracting  $D$  from  $R$ .

|          | $R \sim + C \sim$ |        |         |
|----------|-------------------|--------|---------|
| <b>A</b> | 0.5483            | 1.6356 | 8.8265  |
| <b>B</b> | 0.4000            | 1.1810 | 9.0224  |
| <b>C</b> | 0.6532            | 1.4950 | 9.0752  |
| <b>D</b> | 0.9014            | 2.0719 | 11.3199 |
| <b>E</b> | 0.7336            | 1.8987 | 9.9458  |
| <b>F</b> | 0.6454            | 1.7121 | 9.7846  |
| <b>G</b> | 0.8463            | 1.9852 | 9.1582  |

### A CASE STUDY

The model used in this study was taken from Marri et al. (2002) in UK (Figure 3).

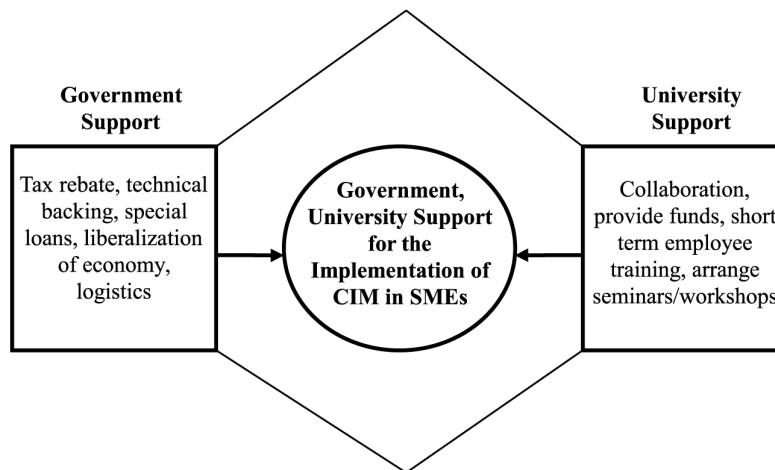


Figure (3): model for illustrating the role of government, university and industries in the implementation of CIM in SMEs (Marri et al, 2002)

Ranking factors affecting relationship between government–university–industry on the implementation of CIM in is regarding as the case study in this paper. In this section, the

proposed fuzzy DEMATEL approach is applied to the ranking factors for 20 cooperative in Rasht, IRAN. There are seven factors in our model and they are as follows (Table 4):

Table (1): Academic and governmental factors affecting the successful implementation CIM in SMEs

| Criteria                         | Definition                                                                                                                                                                                                                                                                                     |
|----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Tax rebate (F1)                  | is a refund on taxes when the tax liability is less than the taxes paid. Taxpayers can often get a tax refund on their income tax if the tax they owe is less than the sum of the total amount of the withholding taxes and estimated taxes that they paid.                                    |
| Technical backing (F2)           | Government support for technology transfer                                                                                                                                                                                                                                                     |
| Special loans (F3)               | Is a loan subsidized by the government, which protects lenders against defaults on payments, thus making it a lot easier for lenders to offer potential borrowers lower interest rates. Its primary aim is to make home ownership affordable to lower income households and first-time buyers. |
| liberalization of economy (F4)   | Is the lessening of government regulations and restrictions in an economy in exchange for greater participation by private entities; the doctrine is associated with classical liberalism.                                                                                                     |
| logistics (F5)                   | Is the management of the flow of data and goods between the point of origin and the point of consumption in order to meet some requirements of customers or corporations.                                                                                                                      |
| Short term employee training(F6) | Is the acquisition of knowledge, skills, and competencies as a result of the teaching of vocational or practical skills and knowledge that relate to specific useful competencies.                                                                                                             |
| Arrange Seminars/Workshops(f7)   | Is generally, a form of academic instruction, either at an academic institution or offered by a commercial or professional organization.                                                                                                                                                       |

This study using 5 Likert - type scale from very low to very good option and fuzzy rating based on table (2) was carried out. Based on the model (Figure 1) a questionnaire was designed and sent to the 10 cooperatives (Table 3).

Table (2): The linguistic scale and underlying TFN

| Scale of fuzzy number       | Linguistic scales                   | The linguistic scale and underlying TFN Fuzzy number |
|-----------------------------|-------------------------------------|------------------------------------------------------|
| (1, 1, 1)                   | Equally important                   | $\tilde{1}$                                          |
| (2, 3, 4)                   | Weakly important                    | $\tilde{3}$                                          |
| (4, 5, 6)                   | Essentially important               | $\tilde{5}$                                          |
| (6, 7, 8)                   | Very strongly important             | $\tilde{7}$                                          |
| (7, 8, 9)                   | Absolutely important                | $\tilde{9}$                                          |
| ( $x-1, x, x+1$ )           | Intermediate values ( $\tilde{x}$ ) | $\tilde{2}, \tilde{4}, \tilde{6}, \tilde{8}$         |
| ( $1/(x+1), 1/x, 1/(x-1)$ ) | Between two adjacent judgments      | $1/\tilde{x}$                                        |

Table (3): Sample Cooperatives

| Number of companies | Type of Business | Dating company | Number of labor |
|---------------------|------------------|----------------|-----------------|
|---------------------|------------------|----------------|-----------------|

|   |                                   | (years) |        |
|---|-----------------------------------|---------|--------|
| 3 | Cookie Production                 | 17      | 30-50  |
| 1 | MDF Production                    | 11      | 45     |
| 2 | Concrete Production               | 5       | 10-50  |
| 1 | Appliances Production             | 13      | 60     |
| 2 | Chemical Products                 | 20      | 50-100 |
| 1 | Power generation service delivery | 16      | 40     |

**Step 1:** Set up the initial uncertain direct relation

Table (4): the initial uncertain direct relation

| X~ | F1 |   |   | F2 |   |   | F3 |   |   | F4 |   |   | F5 |   |   | F6 |   |   | F7 |   |   | SUM |
|----|----|---|---|----|---|---|----|---|---|----|---|---|----|---|---|----|---|---|----|---|---|-----|
| F1 | 0  | 0 | 0 | 0  | 0 | 5 | 0  | 0 | 1 | 4  | 5 | 9 | 2  | 6 | 8 | 1  | 2 | 3 | 2  | 6 | 7 | 33  |
| F2 | 0  | 0 | 2 | 0  | 0 | 0 | 1  | 1 | 3 | 0  | 0 | 2 | 1  | 4 | 5 | 1  | 4 | 5 | 1  | 2 | 9 | 26  |
| F3 | 3  | 5 | 8 | 2  | 5 | 6 | 0  | 0 | 0 | 1  | 1 | 6 | 0  | 0 | 0 | 2  | 4 | 8 | 1  | 1 | 2 | 30  |
| F4 | 0  | 1 | 2 | 3  | 5 | 9 | 2  | 2 | 5 | 0  | 0 | 0 | 1  | 2 | 7 | 1  | 2 | 7 | 3  | 5 | 5 | 35  |
| F5 | 2  | 3 | 4 | 0  | 0 | 1 | 1  | 2 | 6 | 3  | 5 | 6 | 0  | 0 | 0 | 1  | 2 | 7 | 2  | 2 | 4 | 28  |
| F6 | 0  | 2 | 3 | 1  | 1 | 6 | 0  | 1 | 2 | 3  | 5 | 6 | 3  | 5 | 6 | 0  | 0 | 0 | 0  | 0 | 0 | 23  |
| F7 | 0  | 0 | 1 | 0  | 0 | 1 | 4  | 6 | 7 | 3  | 6 | 8 | 3  | 5 | 6 | 3  | 5 | 6 | 0  | 0 | 0 | 29  |

$$K=1/\max \sum a_{ij} = 0.029$$

**Step 2:** construct normalized uncertain overall-relation matrix by using Eq. (1).

Table (5): Normalized Uncertain Overall-Relation Matrix

| N~ | F1  |     |     | F2  |     |     | F3  |     |     | F4  |     |     | F5  |     |     | F6  |     |     | F7  |     |     |
|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| F1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 | 0.1 | 0.1 | 0.3 | 0.1 | 0.2 | 0.2 | 0.0 | 0.1 | 0.1 | 0.1 | 0.2 | 0.2 |
| F2 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 | 0.1 | 0.0 | 0.1 | 0.1 | 0.0 | 0.1 | 0.1 | 0.0 | 0.1 | 0.3 |
| F3 | 0.1 | 0.1 | 0.2 | 0.1 | 0.1 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 | 0.0 | 0.0 | 0.0 | 0.1 | 0.1 | 0.2 | 0.0 | 0.0 | 0.1 |
| F4 | 0.0 | 0.0 | 0.1 | 0.1 | 0.1 | 0.3 | 0.1 | 0.1 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.2 | 0.0 | 0.1 | 0.2 | 0.1 | 0.1 | 0.1 |
| F5 | 0.1 | 0.1 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.2 | 0.1 | 0.1 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.2 | 0.1 | 0.1 | 0.1 |
| F6 | 0.0 | 0.1 | 0.1 | 0.0 | 0.0 | 0.2 | 0.0 | 0.0 | 0.1 | 0.1 | 0.1 | 0.2 | 0.1 | 0.1 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| F7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.2 | 0.2 | 0.1 | 0.2 | 0.2 | 0.1 | 0.1 | 0.2 | 0.1 | 0.1 | 0.2 | 0.0 | 0.0 | 0.0 |

**Step 3 & 4:** The total-relation matrix T can be acquired by using Eq. (2) and the sum of rows and sum of columns of matrix T through the Eq. (3&4).

Table (6): matrix T

| $T=N*(I-N^{-1}L)-1$ | F1    | F2    | F3    | F4    | F5    | F6    | F7    | Row L |
|---------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| F1                  | 0.006 | 0.014 | 0.018 | 0.132 | 0.072 | 0.042 | 0.074 | 0.357 |
| F2                  | 0.005 | 0.004 | 0.034 | 0.010 | 0.035 | 0.035 | 0.033 | 0.156 |
| F3                  | 0.088 | 0.064 | 0.010 | 0.050 | 0.018 | 0.067 | 0.041 | 0.337 |
| F4                  | 0.009 | 0.093 | 0.073 | 0.019 | 0.044 | 0.046 | 0.095 | 0.379 |
| F5                  | 0.062 | 0.013 | 0.044 | 0.105 | 0.017 | 0.043 | 0.072 | 0.356 |
| F6                  | 0.006 | 0.038 | 0.011 | 0.097 | 0.092 | 0.009 | 0.015 | 0.267 |
| F7                  | 0.017 | 0.020 | 0.126 | 0.110 | 0.101 | 0.102 | 0.020 | 0.496 |
| Column L            | 0.192 | 0.244 | 0.316 | 0.523 | 0.378 | 0.343 | 0.351 |       |

| $T=N*(I-N\sim M)-1$ | F1    | F2    | F3    | F4    | F5    | F6    | F7    | Row M |
|---------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| F1                  | 0.047 | 0.050 | 0.074 | 0.247 | 0.252 | 0.136 | 0.234 | 1.040 |
| F2                  | 0.033 | 0.022 | 0.061 | 0.065 | 0.160 | 0.151 | 0.084 | 0.576 |
| F3                  | 0.169 | 0.168 | 0.036 | 0.106 | 0.091 | 0.171 | 0.089 | 0.830 |
| F4                  | 0.066 | 0.174 | 0.111 | 0.084 | 0.139 | 0.133 | 0.187 | 0.894 |
| F5                  | 0.118 | 0.047 | 0.098 | 0.209 | 0.070 | 0.113 | 0.117 | 0.772 |
| F6                  | 0.092 | 0.068 | 0.065 | 0.204 | 0.194 | 0.052 | 0.062 | 0.738 |
| F7                  | 0.070 | 0.075 | 0.220 | 0.263 | 0.220 | 0.219 | 0.073 | 1.140 |
| Column M            | 0.595 | 0.605 | 0.665 | 1.178 | 1.127 | 0.974 | 0.845 |       |
| $T=N*(I-N\sim U)-1$ | F1    | F2    | F3    | F4    | F5    | F6    | F7    | Row U |
| F1                  | 0.450 | 0.778 | 0.620 | 1.016 | 0.933 | 0.900 | 0.777 | 5.474 |
| F2                  | 0.411 | 0.497 | 0.535 | 0.686 | 0.691 | 0.762 | 0.675 | 4.257 |
| F3                  | 0.610 | 0.762 | 0.498 | 0.870 | 0.683 | 0.918 | 0.606 | 4.947 |
| F4                  | 0.522 | 0.873 | 0.703 | 0.795 | 0.898 | 0.994 | 0.728 | 5.513 |
| F5                  | 0.504 | 0.608 | 0.633 | 0.836 | 0.621 | 0.869 | 0.598 | 4.668 |
| F6                  | 0.405 | 0.621 | 0.459 | 0.706 | 0.669 | 0.580 | 0.444 | 3.884 |
| F7                  | 0.450 | 0.628 | 0.680 | 0.897 | 0.781 | 0.878 | 0.508 | 4.822 |
| Column U            | 3.352 | 4.766 | 4.128 | 5.806 | 5.277 | 5.900 | 4.336 |       |

**Step 5:** Adding rows and columns, de-fuzzy making and ranking factors.

Table (7):  $R\sim + C\sim$

|    |        |        |         |
|----|--------|--------|---------|
| F1 | 0.5483 | 1.6356 | 8.8265  |
| F2 | 0.4000 | 1.1810 | 9.0224  |
| F3 | 0.6532 | 1.4950 | 9.0752  |
| F4 | 0.9014 | 2.0719 | 11.3199 |
| F5 | 0.7336 | 1.8987 | 9.9458  |
| F6 | 0.6454 | 1.7121 | 9.7846  |
| F7 | 0.8463 | 1.9852 | 9.1582  |

Table (8): De-fuzzy making and Ranking the Factors

| Factors                          | De-fuzzy making | Rank | Sort                             |
|----------------------------------|-----------------|------|----------------------------------|
| Tax rebate (F1)                  | 2.399           | 5    | Liberalization of economy (F4)   |
| Technical backing (F2)           | 2.064           | 7    | Logistics (F5)                   |
| Special loans (F3)               | 2.337           | 6    | Arrange Seminars/Workshops(f7)   |
| Liberalization of economy (F4)   | 3.082           | 1    | Short term employee training(F6) |
| Logistics (F5)                   | 2.759           | 2    | Tax rebate (F1)                  |
| Short term employee training(F6) | 2.588           | 4    | Special loans (F3)               |
| Arrange Seminars/Workshops(f7)   | 2.739           | 3    | Technical backing (F2)           |

Obtained rankings indicated that the cooperatives experts, to know important government support, such as economic liberalization and logistics for data and goods over than other factors, in the successful implementation CIM in their companies. Among the reasons for government support of cooperatives can be with their unfair behavior due to its poor bargaining power than large companies, as well as limited access to finance for private financial institutions. Selected cooperatives, those who want run CIM. The question about the role of government in supporting the success implementation of CIM, 89 percent of the cooperatives said that, without government support in terms of tax relief, technical support, special loans and economic liberalization, especially logistics and distribution, there is no possibility of its successful implementation. It is worth mentioning that the open questions in the questionnaire were derived is that the majority of respondents, in addition to the factors mentioned, said that governments need to attend universities in the field of academic support of implementation CIM. The interviews were conducted with respondents stated that, it is better to consult, CIM's projects have included academic researchers to provide advice and if approved will be proposed for implementation of the cooperatives. Research of faculty members often leads to inventions and discoveries which have commercial value. Universities and cooperative partnership for the success of CIM implementation and subsequent support plan is very important. Universities to ensure the results of the latest technologic research, make cooperatives more competitive. Unfortunately, working less and even private industry's willingness to cooperate with universities, so it is obvious that there no needs to be researched. More collaboration of government and industry, as prescribed in the form of programs that do not lead to practical results. However, in other countries, this relationship is low. In a study conducted in UK SMEs of these questions were raised that their interactions with universities continued cooperation in areas such as provision of funds for research in order to learn the latest techniques and modern technologies, short-term workforce training, seminars and workshops in support of the CIM, what is?

34% of respondents indicated very little collaboration with universities in the field of SME budget allocation or short-term training courses, seminars and workshops for employees or even offering the latest scientific information to SME's CIM. 29% of the SMEs said that the funds have been allocated too little to universities, but they are working properly and send workers for short-term training to universities. On the other hand, some companies have special significance for organizing conferences and scientific work-shops, learn about new technologies and continuously improve their manufacturing processes. 21% of companies have formulated a reasonable collaboration; 8% of the SMEs in terms of budget allocation, training, seminars and workshops, support, good assist and 8% of the rest, as universities have very well assist. Although in practice, the results indicate low partnerships between SMEs and universities to equip the CIM, but this collaboration is essential for successful implementation of CIM. Information obtained from the universities, according to the latest research technologies have led to greater competition in the SMEs. Perhaps one of the most important reasons that cause of action based on the findings of empirical research has been mentioned, little assist between SME's and universities exist for the implement of CIM; distrust of the institution to the other. Collaboration between the two institutions would inject a sense of trust between them to increase output tailored to the needs of industry in the economic development of the university. As these applications become more and more tangible outputs that are clearly stronger sense of trust.

## **CONCLUSIONS**

The aim of this paper is to examine the government - industry - university triangular collaboration for implementation of computer integrated manufacturing in cooperatives. For

this purpose, empirical studies in European countries and America, particularly UK were studied and UK model for continuous collaboration and optimize government - industry - University were used. Priority and importance of the factors considered in the model, the experts were polled. Using a multi criteria decision making techniques (F-DEMATEL) for priority and importance of affecting factors the Government - Industry – University from industry and university experts were determined. As a result, 1) Liberalization of economy 2) Logistics 3) Arrange Seminars/Workshops 4) Short term employee training 5) Tax rebate 6) Special loans 7) Technical backing are rank of factors that should be considered by governments and universities as well the CIM run in cooperatives. This study shows that in Iran as in other countries, cooperatives that are willing to implement CIM, have not a good assist with universities and government support in terms of tax relief, technical support, special loans, market liberalization and actions related to the purchase, distribution and logistics does not support.

European experience shows that SMEs success in global competition and increasing exports is subject to acceptance of CIM. Comparative terms one can say that, all co-operatives in Iran are part of the SMEs and successful models of them can be used as a benchmark in the cooperative applications. If properly implemented Article 44 of the constitution, co-operatives as a people-oriented economy, will be the main focus Iran's economy. According to Iran's membership in the World Trade Organization (WTO), the international competition for the planning of the cooperative is required. To compete effectively in global markets, cooperatives should be organized as a fast responsive (FRO) in response to their customers' needs quickly and flexibly. Cooperatives could be due to the SMEs model in the world, equipped with a CIM strategy, to meet the needs of customers in global markets. The adoption of this model for co-operatives in Iran, it is important to note that CIM implementation in co-operatives, only with continuous, interactive and real-time collaboration in triangle Government - University - Cooperatives are possible. Thus, the university manufacturing plans with the support of government to help co-operatives, to be prepared for global competition. For this purpose, researchers can investigate the following areas in order to using results before the equipment co-operatives by the CIM:

- 1) Determine the type of government supports to improve the Government-University-Co-operative collaboration.
- 2) Determine the type of academic supports with empirical studies.
- 3) Evaluation degree of Government-University-Co-operative collaboration in global economy.
- 4) Comparative studies on the Government-University-Co-operative collaboration in global level.

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