IDENTIFICATION OF COOPERATIVE ENVIRONMENT FOR THE DIFFUSION OF INNOVATION IN THE FIELD OF QUANTITY SURVEYING

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Thesis submitted in partial fulfilment of the requirements for the Degree of Master of Science by Research

Department of Building Economics

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Sri Lanka

July 2019

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ABSTRACT

Identification of Cooperative Environment for the Diffusion of Innovation in the field of Quantity Surveying

Construction industry compared with other industries are coping up with the technological revolution which directs new knowledge and information to the field. Thus, professional engaged in multidisciplinary areas must incorporate and directs towards the technological revolution with their adoption in individual and in organizational basis. Thus, the concept of diffusion of innovation emerges and it enables a social system to adopt an innovation with the aid of communicational channels over a period of time.

Nevertheless, within the Sri Lankan Quantity Surveying community, the rate of adoption of innovation is comparatively less and thus, there is requirement of identifying the nature of the social systems and the behaviour of the actors in order to study the current context of community in terms of innovation adoption. Hence their knowledge and information transmission and their impact upon a social system is required to be identified along with the individual participation in the innovation diffusion process. Subsequently, the encouragement of an influential person typically identified as an Opinion leader is required. Thus, the research was aimed to identify the nature of the social system on which actors could collaboratively engage in the process of innovation.

The study encompassed with a comprehensive literature review identifying the, innovations within the construction industry, key components of diffusion of innovation, innovation categories, factors affecting the adoption of innovation, collaboration of innovation management along with the opinion leadership. Quantitative approach through Social Network Analysis (SNA) was applied with measures of cohesion to identify nature of social networks corresponding to different innovations and measure of centrality to identify the individual behaviour of the actors of the social system.

Through the research it is revealed that the behaviour of the social network differentiates with the types of innovation where more diffusion is taken place corresponding to the innovations which are core areas corresponding to quantity surveying profession. Consequently, individual behaviour presents a tendency towards the preventive innovation category as the individual has the flexibility to adopt or reject the innovation.

Keywords: *Diffusion of Innovation, Quantity Surveying, Opinion Leaders, Innovation categorization*

DEDICATION

To my family

For their love, affection, faith

and

incessant support on me.

ACKNOWLEDGEMENT

The successful achievement of my dissertation was accomplished through the guidance and the motivation provided by various people and entities. Thus, I take this opportunity convey my heartiest gratitude and honour to all of them.

Initially, I express my heartiest and beholden gratitude to my research supervisor Ch. QS Himal Suranga Jayasena, for his immense guidance, encouragement and supervision provided for the successful accomplishment of my dissertation. In addition to that valuable advices provided with efficacious remarks aided for the achievement of the utmost success of my dissertation.

Moreover, I convey my sincere gratitude to for Dr. (Mrs)Yasangika Sandanayaka, Head of the Department of Building Economics, for her immeasurable guidance provided for successful completion of the dissertation.

Additionally, my profoundest gratitude is extended towards my Research advisors Dr. (Mrs) Menaha Thayaparan for her persistent assistance and supportive guidance provided for me all the way through the compilation of my dissertation. I extend my sincere gratitude to Dr. (Ms.) Sachie Gunathilake, being the Research Coordinator, for her guidance throughout the course of this research. Furthermore, my tremendous appreciation is extended to other academic staff member, Research Assistants, Non-academic Staff members of the Department of Building Economics, all the Academic and Non-academic staff members of post graduate Studies Division and Faulty of Graduate Studies for their immense encouragement and guidance bestowed throughout the entire academic period.

I gratefully acknowledge the funding received towards my MSc from the SRC (Senate Research Committee) Grant, University of Moratuwa.

Furthermore, my sincere appreciation is conveyed to all the industry practitioners for their indebted support, guidance and cooperation extended during the data collection phase which greatly ensured the success of my thesis with their valuable opinion and commentaries.

Finally, my profoundest appreciation is towards to my family members, friends and all others who assisted me throughout the successful completion of my thesis.

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LIST OF ABBREVIATIONS

BIM	=	Building Information Modelling
CA	=	Change Agent
CAD	=	Computer-Aided Design
DOI	=	Diffusion of Innovation
QS	=	Quantity Surveyor
QSs	=	Quantity Surveyors
SNA	=	Social Network Analysis

LIST OF APPENDICES

1.0 INTRODUCTION

The perception of diffusion of innovation influence on the transmission of innovatory resolutions in diverse fields and among its key components social systems and communication channels act in the effective dissemination of a novice solution. This enable in the transformation of an innovation among a social system with the influential personnel to pursue them within fellow individuals being an opinion in the perspective of the specified innovation. Communication within a social network enable in the transmission of a novel aspect among its actors and its applicability in the social networks of Quantity Surveying enable the development of the field to suit up with the both local and international market requirements. The constitution and the characteristics of a social network aid in the identification of the nature of the network which instantaneously construe the behaviour and the relations exist among Quantity Surveyors.

1.1 Background

It has been identified that with the globalisation, the construction industry has been forced to advance into an area that is continuously changing to accept the requirements of the wider background in which the procedures are implemented (Ochieng & Price, 2009). Pryke (2004) identified that the construction industry is biased and occupied by professional bodies initiated by Architects, Engineers, Quantity Surveyors and Contractors. Thus as per Zulch (2014) in order to accomplish the objectives and goals of a construction project the knowledge and information are essential to be composed, collaborated and transmitted by the members of the construction project. Subsequently, Wen and Qiang (2016) stated that for the conversion of the construction sector to an inclusive knowledge and to an information context must be accompanied with the fast progression in construction technology. Hence the formation of network within construction industry is an important acceptable method since various complex relations are involved within the parties engaged in a complex manner at numerous stages in the progression of a construction project (Ling & Li, 2012). As per specified by Azhar and Abeln (2014) the construction industry, compared with other sectors are at the start of the implementation new possessions to enable their requirement of

communication within other parties. Nevertheless, Eddie, Cheng, Li, Peter and Irani (2001) contended that the communication among professionals is restricted due to lack of open communication or procedures, unproductive channels of communication and unforeseen communication failure which eventually lead to the requirement of formation of construction networks which have caused in advantageous interactions among stakeholders of construction field. Consequently, Olanrewaju (2016) held that along with the challenges within the construction industry, among the parties engaged in construction projects and fundamentally Quantity Surveyors are the individuals who had to lead and who are essential to obtain required skills and being finest at the practice with the required experiences and knowldge. Hardie, Miller, Manley and McFallan (2005) revealed, even though innovations among Quantity Surveyors are hidden compared to other innovations related to design and technology, an undertaking of innovation is seemed to be present in areas such as management and monitoring processes.

According to Senaratne and Sabesan (2010) knowledge formation originates at the individual point comparable to other fields in the field of Quantity Surveying and in order to be productive within the organization, the knowledge and information must be communal, preserved, acceptable and well networked. Thus, prerequisite of energetic participation within among professionals including Quantity Surveyors is be evidently recognised. Furthermore, as stated by Xin and Qiaozhu (2013)

Diffusion of Innovation

Diffusion of Innovation (DOI) through social network has been intensely researched on several other fields, regarding user behaviour of newly emerged innovations.

Diffusion of innovation (DOI) has taken an important perception among various range of specialities among different fields ranging through sociology, management, economics and marketing over forty years of time (Kale & Arditi, 2009). Correspondingly, Murray (2009) indicated that DOI theory has been utilized in wide range of areas including communication, marketing, and public health while it aided for researchers to figure out the technique by which innovative notions and technologies have driven into extensive practice. Taylor and Levitt (2004) identified that construction industry was unsuccessful in the dispersion of parallel innovations

which was successfully adopted in manufacturing industry which highlighted the impediment of application of common technology diffusion models to explicate the DOI with regard to construction industry.

The social system establishes a limit in which an innovation spread and there are relationships among system's social structure and the process of diffusion of innovation concerning the opinion leaders' and change agents' role, innovation-decisions categorization, and the significances of innovation (Rogers, 2003).

Additionally, the author has identified structure of a social system as the modelled arrangements of the elements in a system which offers consistency and steadiness to behaviour of humans in a system enabling envisaging of their behaviour to a certain reliable extent.

Innovations and their characteristics

Limited, but as if any, innovation researches undeviating explore the primary dissimilarities amongst project-based and non-project based industry organizations however, certain researches have focused on more through innovation studies on the project-based nature of the construction field (Gann & Salter, 2000). Conferring to Downs and Mohr (1976), several innovation studies emphasised on primary and secondary innovations characteristics but not succeeded to focus on the differences among them where "Primary characteristics" are integral considering the innovation or technology and steady along organizations whereas secondary characteristics are focused upon opinion-based characteristics. Moreover, Baldridge and Burnham (1975) stated that DOI ought to transfer from personnel to organizational structure and environmental aspects in which individual characteristics are not imperative factors of innovative behaviour amongst individuals in complex firms though, managerial positions influence and encompass within the individual in the process of innovation, where organizational characteristics strangely influence the organization's innovative behaviour. As identified by Mustonen-Ollila and Lyytinen (2003) in Rogers's model of DOI five sets of characteristics were identified which impact upon the adoption of innovation considerably as innovation factors; individual factors; task factors; environmental factors; and organizational factors which are further splits up to several traits. Prior to the adoption or rejection of an innovation, decision makers arrive to the conclusion by primarily achieving some knowledge of the purpose of the innovation,

which results in the development advantageous or disadvantageous mindset on concerning its prospective value to the organization (Sun, Cegielski, Jia, & Hall, 2018). It has been identified by Damanpour and Schneider (2006) with the awareness of prospective innovations , the organization embraces the most appropriate or viable innovation and implementation of it uninterruptedly till the innovation becomes a customary within the organization. With the impact of dynamic business world firms are more focused on the commencement of novel innovation irrespective of the fact that they are under the implementation early stage of the prior adopted innovations. (Chung, Choi, & Du, 2017).

Opinion Leadership

Though the opinion leaders are to be found on a social system, the challenges they surpass in the dissemination of innovation is yet to be relived. Yankah and Dadzie **(**2015**)** identified three aspects persuading the significant in supporting in the advancement of innovation in the Quantity Surveying Consultancy Firms namely as leadership, supportive work environment and awards, grants and funds. Dalrymple, Shaw and Brossard **(**2013**)** recognized that social impact is influential and predominant with in a society .Masuda **(**2015**)** widely recognised that peer-to-peer collaboration among the persons rooted in social networks influence the opinion creation on a great scale. However, opinion leaders do affect diffusion of ideas and also are more influential than non-opinion leaders in a social system. The ability of the opinion leaders to influence decision making may be relative to the group norms and the expertise of the opinion leaders in question (Udemezue, 2018).

Management of innovation necessitates that the organization is proficient with synchronising a variety of imaginative, fruitful and marketing resources, with funds, technological items, skills of human, knowledge on marketing and social capital (Dodgson, Gann, & Salter, 2008), from a various number of actors, together with mobile workers, user communities, component suppliers, competing organizations and venture entrepreneurs (Chesbrough, 2003). It follows that the inventive firm essential to discover methods to access, combine and integrate mixed bases of knowledge in order to advance novel products and services (Blomqvist & Levy, 2006). The diffusion of information within the social network represents many novel aspects associated with the out-dated media diffusion of information, (Liu & Liu, 2018).

Rogers (2003) highlighted, the streaming of communication are supported by the opinion leadership along with the diffusion network. Furthermore, as stated by Brown, Chen, and O'Donnell (2017) a social network is exemplified with interactions between opinion leader and different opinion seekers in organizations either by their willingness or by force which emerge beneficial and supportive in building up the relations in a social network. Moreover, picturing of network aid in clear and enhanced understanding in the flow of communication within it (Kunz, Kastelle, & Moran, 2017). Accoding to Cartlidge (2003) the use of respective websites for each and every use and for the development competencies in the field of Quantity Surveying is at a higher rate. Değerli, Aytekin, and Değerli (2015) highlighted that the amalgamation of mass media mass and interpersonal communication networks is required in the progression of diffusion.

Innovation with respect to Quantity Surveying

In spite of the above, the diffusion of innovation is not yet completely revealed with regard to the Quantity Surveying field in respect to the current use of innovations. With regard to that adhering on to the procedure of procurement, transferring and dissemination of innovation could be attained through the complete use of innovative approaches (Aouad, Ozorhon, & Abbott, 2010). Hardie et al. (2005) stated that the Quantity Surveying community can be identified as collaborators for the innovation and but not identified as the leaders of the community to promote the innovations. Consequently, the flow of communication and knowledge can be in cooperated with the use of the social networks (Kossinets, Kleinberg, & Watts, 2008) where for the proper diffusion of innovation. As acknowledged by Kempe, Kleinberg, and Tardos (2003) the perception of understanding the traces of adoption within the fundamental social network is important.

1.2 Research Problem

An innovative technology could not be implemented by an organization except knowledge about it is initially accessible to employees of that firm. Therefore, a significant part of the diffusion procedure includes the dissemination of knowledge and information that permit individuals in an organization to deliberate of novel thoughts about technological expansion (Swan & Newell, 1995). Rogers (2003)

recommends that organizations that are comparatively earlier in accepting novel concepts than other individuals of a system are innovative. Nevertheless, a choice of not to adopt, or to discard, a new idea does not inevitably concern that an organization is not inventive as the novel knowledge might not be suitable for that organization. Inter-organizational networks are means by which regulates the horizontal and vertical collaboration among organizations. Over these networks, organisations could exchange knowledge and resources required to boost the innovation. With the higher number of inter-organizational networks involvement that the organization has the better possibility of accomplishing adaptive effectiveness (Porter, 1990).

According to (Xu & Quaddus, 2013) in order to stay ahead of the competition, organizations have to continually develop new competitive advantages deprived of significant determination. Over time, the edge may wear away as contestants attempt to replica a positive benefit for themselves and as market fluctuates (Ghaben & Jaaron, 2015).

Construction is frequently considered to holdup behindhand other sectors equally in relations of its integral capabilities to innovate and advance improved conducts of working, and in its apparent that there is an incapability to adopt innovations from other extents (Harty, 2008).The construction industry of Sri Lanka, even though still late in consideration of technological innovations, which is related to other construction industries namely as United Kingdom with respect to methods of Project Management and their methods. (Senaratne & Ruwanpura, 2016). Thus, there has been a significant delay in adopting innovative tools and practices among the Quantity Surveying community in Sri Lanka. Poor diffusion of innovations among Quantity Surveying community in Sri Lank is apparent awhile the world is moving ahead with modern day tools, methods and process such as Building Information Modelling (BIM), majority of Sri Lankan Quantity Surveyors are yet to adopt innovations such as computer aided quantity take- off and linked price libraries, which had been there for more than two decades. Quantity surveyors will be able to protect their future in the technically emerging industry while improving their knowledge on BIM technology and collaboration practices, bring up-to-date on industry procedures in Sri Lankan context (Nagalingam, Jayasena, & Ranadewa, 2013).

While, a few of Quantity Surveyors have taken steps to adopt latest innovation, there is a general reluctance for innovations among the majority. Since Sri Lankan Quantity Surveying platform is subjected to innumerable adoption on innovations it is required to identify the Opinion leaders among Sri Lankan Quantity Surveyors and their behaviour for the dissemination of innovative solutions among the Quantity Surveying community.

1.3 Aim and objectives

To identify the nature of the social system on which Quantity Surveyors could collaboratively engage in the process of innovation

1. Identification of key components in the diffusion of innovation and critical factor for the adoption of innovation.
2. Identification of adopter categories and opinion leadership with relation to diffusion of Innovation.
3. Identification of structure of social network among Quantity Surveyors of Sri Lanka corresponding to different categories of innovation.
4. Identification of status of the opinion leaders among Quantity Surveyors corresponding to different categories of innovation.

1.4 Methodology

The initial stage of the research comprised and conducted along with a comprehensive literature survey to explore on the of diffusion of innovation and critical factor for the adoption of innovation, adopter categories opinion leadership and their characteristics. The literature survey conducted with reference to the books, journals, electronic articles and papers from conference proceedings. Subsequently, a questionnaire survey was carried out for the deriving of Social Network in terms of communication network for Quantity Surveyors in terms of different innovations and in order to identify the relevant use of innovation. Finally, Social Network Analysis was conducted to identify the nature of social network in respect to each innovation and their opinion leaders in each network for the cooperative environment of innovation diffusion in respect to the field of quantity surveying.

1.5 Scope and Limitations

Social Networks of Quantity Surveyors in respect to different categories of innovations was considered on this study. The Social Network will be limited to the to the professional practitioners in the field of Quantity Surveying.

1.6 Chapter Breakdown

The presentation of information and research findings will be segmented as follows.

Chapter 01-Introduction

The initial introduction along with the comprehensive background to grasp the research problem for the reader. Additionally, the chapter extend the aim and the established objectives to pursue the recognized objective along its limitation and methodology to follow in carrying out the research.

Chapter 02- Literature Review

A literature review on the diffusion of innovation and critical factor for the adoption of innovation, adopter categories opinion leadership and their characteristics. will be carried out which would accomplish objectives 01 and 02.

Chapter 03-Research Methodology

The chapter will depict the methodology accomplishing the objective 03 and objective 04 in investigating social networks and pinion leadership among Sri Lankan Quantity Surveyors along with their followers

Chapter 04-Findings and Analysis

Analysis and the representation on the findings of the research is presented in the chapter while accomplishing objective 03 and 04.

Chapter 05-Conclusions and Recommendations

The recommendations and derived conclusion from the analysis are depicted.

2.0 LITERATURE REVIEW

The chapter presents the literature findings expressed on the background research which was carried out to identify the research problem and commenced with the identifying status of innovation in the field of construction. The concept of diffusion of innovation was identified which act as the basis for the key components described are described initially including critical factors affecting the adoption of innovation. Subsequently, knowledge interaction within the innovation process and its management and impacts for a social network is discussed. With that concept opinion leaders, their characteristics and their identification methods and innovation prevailing in the Quantity Surveying field identified at the last stage. Finally, a brief summary of the literature review is presented.

2.1 Innovation and Innovation categorisation

In terms of research based on innovation diffusion it usually defines an innovation as "an idea, practice, or object perceived as new by an individual or other unit of adoption" (Rogers, 2003, p. 36). Taylor (2005) contends that when an innovation is associated with the distribution of work in a network, then execution does not encompass the distinct complications that are accompanied with interorganizational knowledge improvement.

According to Utterback and Abernathy (1975) innovations could be identified as in products or processes. Additionally, according to author it is significant to concern that innovations of product frequently necessitate and initiate process innovations and vice versa. Sheffer and Levitt (2010) has identifed four categories of innovations as incremental, modular, architectural, and radical. Within the first two categories, the innovation is confined in distinct or numerous subsystems. An *incremental innovation* improves and encompasses a recognized design where advancement befalls in individual sections, where fundamental design perceptions, and relations among them, does not change (Sheffer & Levitt, 2010). According to the author *modular innovation* deviate a fundamental design perception deprived of altering the architecture of the product. While on the other hand *architectural innovation* vary the method in which

the components of a product are connected whereas parting the fundamental design concepts unchanged where a *radical innovation* starts an original foremost design and, henceforth, a novel fundamental design perceptions personified in sections that are related together in an innovative architecture(Sheffer & Levitt, 2010).

2.1.1 Attributes of innovation

Rogers (2003) recognized five characteristics of innovation which diminish the ambiguity and upsurge the rate of the innovation as relative advantage, compatibility, complexity, trialability and observability. Further, the author specified that innovations which compromise of more relative advantage, compatibility, simplicity, trialability, and observability have a tendency to be adopted quicker than other innovative notions.

Relative advantage is identified as the degree to which an innovation is apparent as being improved than the idea it surpasses (Rogers, 2003). Thus, it could be articulated in relations of its sub components like, cost-effectiveness, low initial cost, low uneasiness, higher social status, time saving, effort saving, and contiguity of reward. Consequently, ROA is increased with the more relative advantages.

Compatibility or incompatibility of an innovation could be identified in three dimensions as sociocultural values and beliefs, earlier existing ideas and/or client requirements for the innovation. Hence, if an innovation is well-suited with a person's requirements, then ambiguity will diminish and with the increase of rate of adoption.

Complexity as per Rogers (2003) is the degree to which an innovation is supposed as comparatively hard to understand the innovation. In contradictory, easiness to recognise and use the innovation which subsequently upsurge the rate of adoption and contrary to the other characteristics, complexity is negatively associated with the ROA.

Trialability as identified by Rogers (2003) is the degree to which an innovation might be tested with on a limited basis. If the more an innovation is tried, the adoption will be faster. Reinvention may occur during the trial and when it is at a higher degree, increases the ROA and it means that the innovation is more flexible and can be easily transformed to be fit for a wider range of adopters (Backer, 2000).

Observability referring to Rogers (2003) is the degree to which the consequences of an innovation are observable to respondents or the individuals in which observation

by the peer is the significant motivational aspect in the adoption and diffusion of technology as per Parisot (1997). Once the observability is higher it is positively interrelated with the ROA of an innovation.

2.1.2 Type of innovation and categories of innovation decision

Mainly types of innovation and the categorization of the innovation decisions are mainly focused on here and per the concepts of Rogers (2003) in means of diffusion of innovation

Types of innovation

Rogers (2003) identifies two types of innovations mainly, as preventive innovations, which the individuals adopt new idea to reduce the probability of some unwanted event and incremental (non-preventive) innovations, which provides the desired outcomes in the near future. Hence, ROA is higher in non-preventive innovations as it reduces the risk relatively and has the continuous improvements on its products and therefore the products are more competitive in nature.

Categorization of innovation decisions

According to Rogers (2003) identified organizational innovation decisions can be optional, which illustrates the individual flexibility to accept or throwaway an innovation or co-operative, adopt or reject is made by the agreement among the members of a system, which have more sustainability, or authority, which the few individuals in a system who are having power, high social status or technical expertise make choices to adopt or reject an innovation and once the choice is made organization's employees must comply with that which enact contingent decision of them. These innovation decisions yield the high ROA vice versa produce high resistance.

2.2 Diffusion of Innovation

According to Udemezue (2018) diffusion and adoption are complicatedly related in a way that considering adoption discretely might make adoption will create spaces in the receiver's Thus, it is required to identify the diffusion of innovation, where adoption of innovation also correspondently in induced with process of innovation diffusion. Consequently, Adekoya and Tologonse (2005) expressed that diffusion is a

progressing activity including exchange or flow of innovation among other entities or among a group of people. Further, (Nwogu,2008) explained that DOI is the dispersion of information regarding the concerned innovation among people which due to a decision of an individual for the innovation adoption. Rogers (2003) demarcated diffusion as "the process by which an innovation is communicated through certain channels over time among the members of a social system". Correspondently, innovation is identified as the concepts, practices which are distinguished as a distinct or another unit of adoption (Kale & Arditi, 2009). Mahajan et al. (1990) articulated that cumulative adoption of an innovation trails an overall S-shaped curve consisting of a commencement and implementation stage with growth of a reduced speed, an adoption stage with swift growth; and (3) a saturation phase with a retarding growth.

Considering the adoption of new product or invention, it is most prominently identified as a hierarchal procedure which commences from knowledge or understanding and evaluating the particular invention and then to the complete adoption of it (Zhu & Kraemer, 2005). According to Rogers (2003) conventional models of diffusion are established on the notion that more awareness about innovation the among the consumers will results in acceptance of innovation. Moreover, author stated that it is believed that consumers act upon their insight, as they get to know the appeal of the considered innovation adoption. Subsequently, when the consumer knows and identify that there is a necessity to be satisfied with the innovation, that individual commences the evaluation of the innovation process (Hassan, Mourad, & Tolba, 2010).

The three key factors of the process of adoption as recognised by Rogers (2003) are:

- The innovation. Attributes of the new product influence on the rate of adoption
- The potential adopters
- The process of communication by which the possible adopter ascertains about the innovative product

Camison, Lapiedra-A, Segerra and Boronat (2004) claimed that what all definitions of an innovation share in common is the effectiveness of the new idea that is implemented. Product innovation is the introduction of a product which is new or extensively improved with respect to its features or intended uses. Within that context, innovation is perceived as a procedure which is an outcome after numerous relations

amongst various actors which enable the enhanced information flow, resources and trust required to innovation diffusion (Zeng, Xie, & Tam, 2010).

For an individual to adopt an innovation that person shall decide on that where Innovation Decision Process (IDP) is facilitated as shown in Figure 2.1. Thus, as per Rogers (2003), it is activity engaged with initial search of and then of processing it, in which the person is is driven to lessen doubts about the benefits and drawbacks of the particular innovation. Moreover, the author stared that five stages are included in the IDP in a timely ordered sequential manner as knowledge stage, persuasion stage, decision stage, implementation stage and confirmation stage.

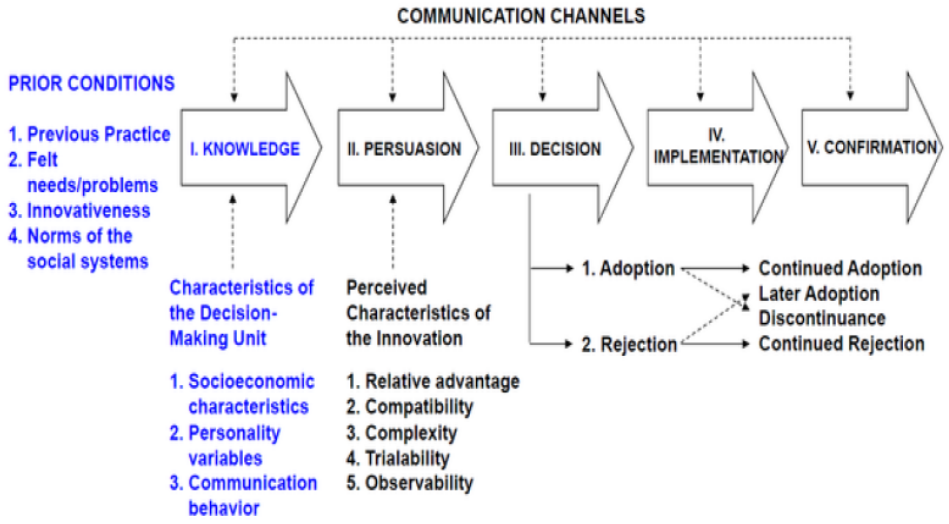

Figure 2.1: Innovation Decision Process

Source: Rogers (2003)

Knowledge stage as specified by Rogers (2003) is the effort of an individual to decide on the innovation on the aspects of what it is, how it would be an innovation and the reason for it to be an innovation. People try to search for what are the innovations existing identified as “awareness knowledge”, the way in which innovations cooperative to overcome the difficulties is identified to be “How to knowledge” and the way in which and why an innovation works is known to be “Principles knowledge”. Since the technology is not present at an expected level, it is crucial to know the information and how technology work successfully and appropriately (Spotts, 1999). Consequently, as per Seemann (2003), in order to generate new knowledge,

technology education and practice must offer not only by what means to experience it but also a recognize the requirement of that experience.

Persuasion stage is the point at which people make favourable or unfavourable opinions to the innovation. Henceforth it is more sentimental compared to the intellectual or knowledge centred aspect. Ambiguity towards the operation or the function of the innovation and societal factors/opinions impact on the person's views and beliefs about the innovation (Rogers, 2003).

Decision stage is which the individuals make decisions whether the innovation could be adopted (Rogers, 2003). Rejection is possible within any stage of the IDP in the way of active rejection where a situation of revoke the decision of innovation after the adoption where as if it in earlier stage known to be the passive rejection.

Implementation stage is which the innovation is taken in to action.According to Rogers (2003) to eradicate the vagueness about the consequences of an innovation technical help from Change Agents and from other experts could be taken. At this implementation stage, reinvention regularly occurs and if it takes place more quickly, that innovation will be established.

Confirmation stage is the stage at which the individuals search for support for the decision on the innovation adoption. Furthermore, conferring to Rogers (2003), the decision could be overturned if the individual is conflicted about the particular innovation. Thus, viewpoints of individuals is identified to be more critical which causes later adoption or rejecting an innovation to adopt a improved innovation or later the individual rejects the innovation since that does not meet the requirements of the individual and which root for dissatisfaction on the performance of the innovation.

2.2.1 Innovation process within organizations

"An organization is a stable system of individuals who work together to achieve common goals through a hierarchy of ranks and a division of labour" (Rogers, 2003). The perception of innovation process within an organization was initiated based on execution an innovation instead of the adoption of the innovation.

The innovation process within an organization as represented in Figure 2.2, comprise of five main stages which is primarily separated in to two comprehensive actions as initiation, which is encompassed of two sub-sections as agenda setting and matching,

and implementation, which is encompassed of three sub-sections as redefining/restructuring, clarifying and routinizing.

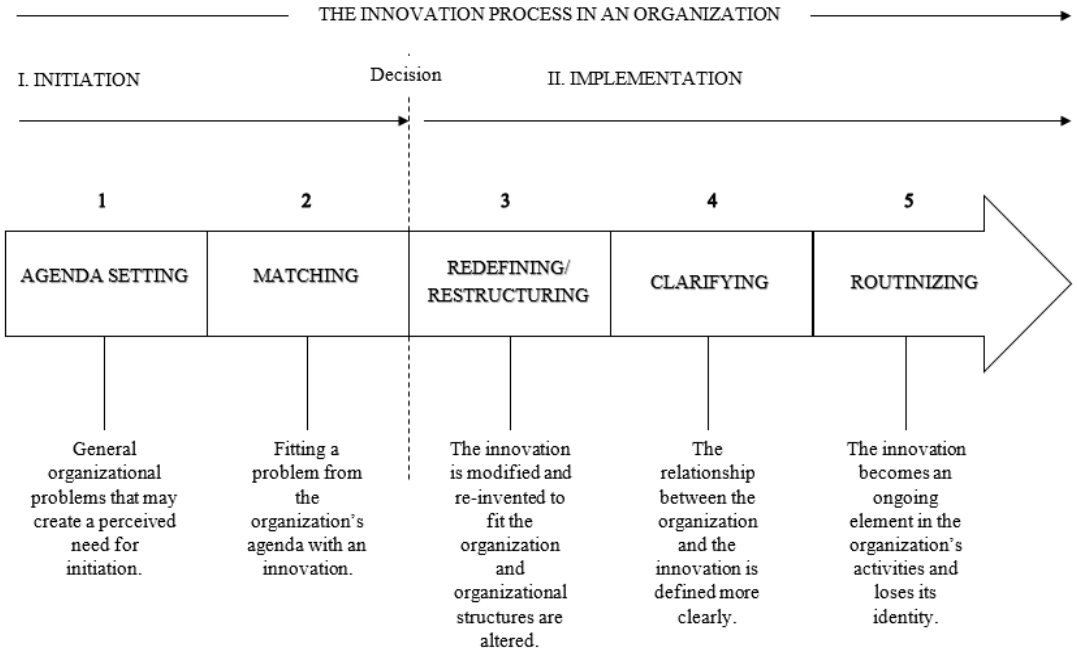

Figure 2.2: Innovation process in organizations

Source: (Rogers, 2003)

Agenda-setting as per Dearing and Rogers (1996) is the means by which requirements, difficulties, and matters arising up over an organisation are arranged in an order for consideration. Additionally, it aids to outline the performance gap of the organization and similarly concentrate on finding and ranking requirements or complications and seeking the latent innovations which are beneficial to overcome the organizational difficulties.

Matching is the process of compatibility testing for how the innovation is suitable to overcome the recognised needs and problems through set agenda (Rogers, 2003). Here, determines the feasibility of innovation towards the problem solving of the organization.

Redefining/Restructuring is the procedure by which the innovation is reinvented to tally with the organization's necessities and prepare them more cautiously (Rogers, 2003). Thus, the innovation emerges within the organization and from exterior causes having flexibility and if the reinvention has been happened to tie it finest match, the individual distinguishes it.

Clarifying *i*s comprised of social structure of members of the organization on the innovative idea which was executed to get the viable benefits and aids from it (Rogers, 2003).

Routinizing is the phase which the innovation procedure is finished, and the innovation has turn out to be combined with the actions of the organization which has where its distinct uniqueness is vanished (Rogers, 2003).

2.2.2 Critical Factors Affect for the Adoption of Innovation at an Individual Level

Rate of Adoption (ROA) is defined by Rogers (2003) as the comparative pace of innovation adoption by the individuals in a social system which is commonly computed as number of people who adopt an innovation in a definite period of time. It indicates the heights of success which the innovation has developed and united within the individuals in a social system. Consequently, DOI concerning at an individual level could be represented in terms of ROA. Rogers (1995, 2003) as per Figure 2.1.

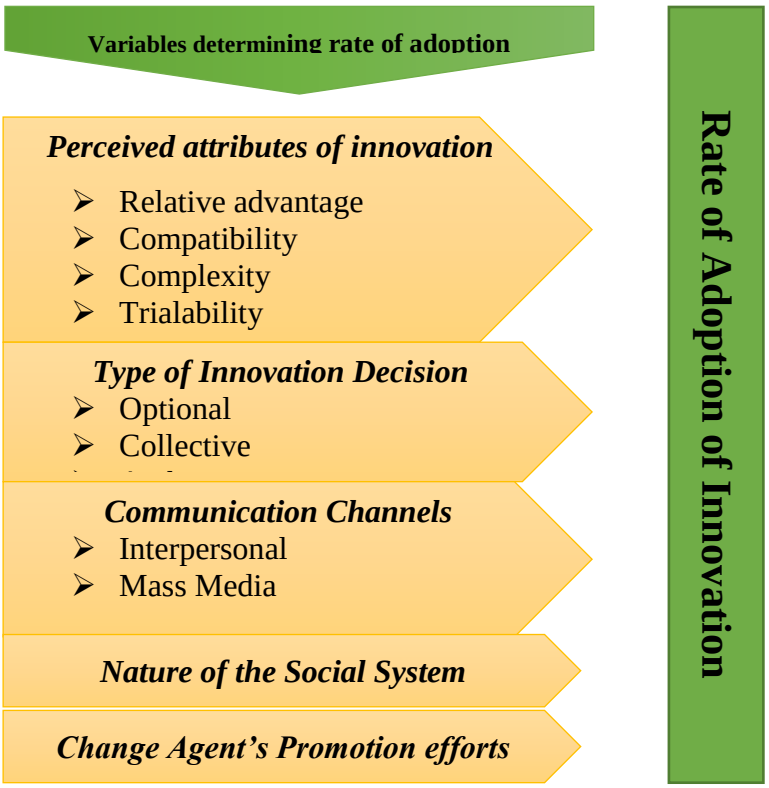

Figure 2.1: Variables affecting Rate of Adoption

Source: (Rogers, 2003)

2.3 Critical Factors Affect for the Adoption of Innovation at Organizational Level

Rogers (2003) identified three types of independent variables correlating with organizational innovativeness as leader characteristics, organizational structure and external factors.

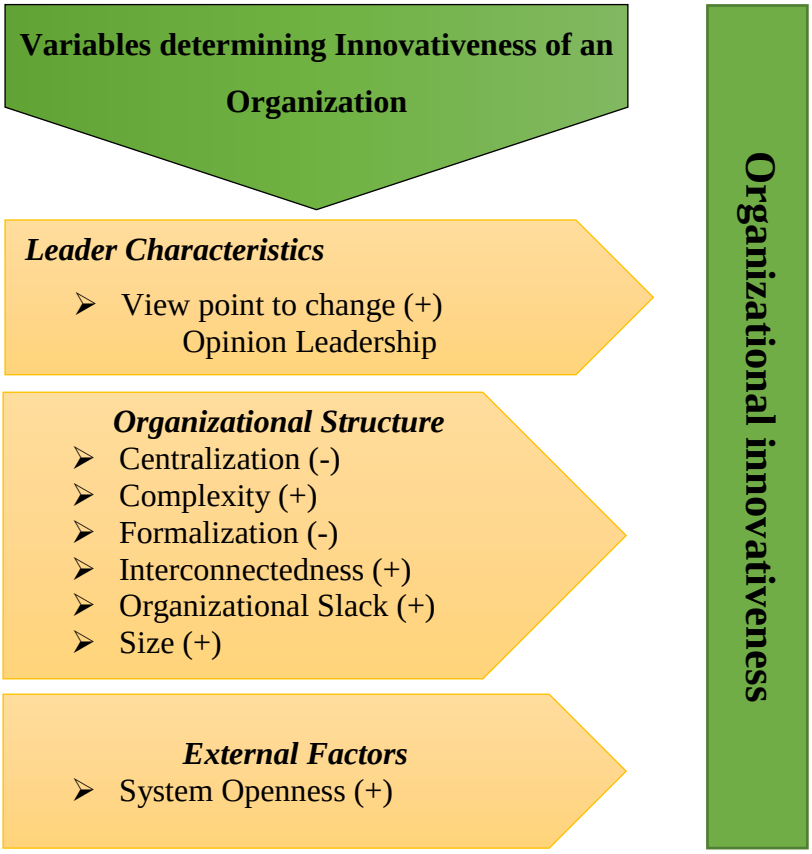

Figure 2.2: Independent variables correlating with organizational innovativeness

Source: (Rogers, 2003)

2.3.1 Leader characteristics: Opinion leadership

Rogers (2003) explicated, opinion leaders are individuals who can influence on others' view. Furthermore, opinion leadership is the degree of casual impact on people's attitudes on the way to the adoption of an innovation. Additionally, as the features of an opinion leader like, external communication, user-friendliness, socioeconomic status and innovativeness, their role is substantial to define the ROA of an innovation within a social structure.

2.3.2 Organizational structural characteristics

Rogers (2003) recognized six organizational structural features which impacts on the organizational innovativeness and they are further elaborated as follows.

Centralization is identified as the degree of authority and control which are focussed amongst limited number of persons, which negatively impacts the innovation diffusion as novel notions are controlled by the solid leaders who rule the social system. Nevertheless, Rogers (2003) explicated that, this one-way hierarchical flow of communication channel is more beneficial for innovation adoption at organizational context as it is encompassed of group of technical specialists, focused on to developing the value, synchronised efforts at technology transmission and advance adoption of innovations for social welfare.

Complexity is the degree of high level of knowledge and expertise is rest within the members of an organization (Rogers, 2003). Hence, when the knowledge and expertise is more on the innovation, it enhances the adoption process of innovation within the social system.

Formalization is the degree of following rules and procedures by the members of an organization (Rogers, 2003). Moreover, it is a measure of bureaucratic and negatively affect with innovation adoption but once adopted, encourages the implementation of innovations.

Interconnectedness is the degree of interpersonal networks which connect elements in a social system and advanced degree of interconnectedness improve innovativeness positively over advancing flows of novel concepts among its members (Rogers, 2003).

Organizational slack is the degree of accessibility of free possessions and funds in an organization which positively correlated to organizational innovativeness, predominantly with innovations engaged with higher cost (Rogers, 2003).

Size of the organization is positively associated on innovation diffusion as numerous scopes in terms of resources available, workers' technical proficiency, structure of the organization (Rogers, 2003).

The above identified organizational structural features impact on the ROA of an organizations in cooperation of positively and negatively as the characteristics as the low centralization, high complexity, and low formalization, leans towards the

difficulty for an organization to implement an innovation (Zaltman, Robert & Jonny, 1973).

2.3.3 External factors: System openness

Rogers (2003) specified that the system openness is contradictory of formalization which is identified as the degree of members who are in the system are connected to other people who are exterior to the organisation. Additionally, Robertson and Gatignon (1986) expressed that, innovation adoption is required in in extreme competitive markets to sustain their positions within the market. Subsequently, Lee (2002) further reinforced this as it might lead competitive disadvantage with non-adoption of an innovation.

2.4 Innovation and Construction Industry

Innovation within construction industry is distinguished to array in a large area owing to different factors that rule the industry in terms of government, requirements of client and organizational influence which lead on to gain the qualitative product with the lower cost gaining a financial benefit (Kaluarachchi & Jones, 2008). (Bossink, 2004) explained that merging of technological and organizational aspects is vital within the innovation procedure. Hardie et al. (2004) specified for the continuous development and for the cost-effectiveness of the built environment the management of the innovation within construction industry is expressively vital. Furthermore, Pryke (2004) stated for a construction project is accompanied with networks of information transmission which characterised along with the functions of the project and network of contractual relationships. Technological innovations include improvements to construction materials, building construction and machinery whereas the innovations within an organization comprise of variations and developments with communication processes , business approaches, human resources and knowledge management (Bossink, 2004).It has been identified by Rigby, McCoy and Garvin (2012) that diffusion of innovation in construction industry could be occur in either way of horizontally or vertically. Vertical diffusion or known as integration of innovation by Rogers (2003) comprises of share of information, procedures and products amongst different number of stakeholders and within various stages of construction projects

whereas horizontal diffusion encompasses with the diffusion of innovation among a group of specific stakeholders or a stage of a construction project whereas they interchange the information and producers among themselves only.

2.4.1 Knowledge interactions within the process of innovation

Generally, it is acknowledged that which is applicable in several sectors including in the areas of business and science where policy actors are participated within the process and strained in perceptions of systems of innovation and the network approach (Thorgren, Wincent, & Örtqvist, 2009). Innovation networks might correspondingly contain supplementary informal connections among corporations and organizations, (Asheim,1996)

	static (knowledge transfer)	dynamic (collective learning)
formal / traded relation	(1) market relations	(3) cooperation / formal networks
informal / untraded relation	(2) knowledge externalities and spillovers	(4) milieu / informal networks

Figure 2.2: Categories of knowledge interactions within the process of innovation

Source: (Thorgren, Wincent, & Örtqvist, 2009).

Networks and milieu are ideally diverse among the above identified groups as they are grounded on evolutionary or sociological methods. Besides according to authors, networks are extra strong and co-operative relationships among definite cohorts within the innovation procedure. If a considered technology or knowledge is interchanged, developed by further enhancing the knowledge base which results in an active course of cooperative learning (Katzy & Crowston, 2008)

Thus, the social capital (Wolfe, 2002) or a collective culture is leading to an exact innovative setting The speedy interchange of concepts and knowledge is crucial to an innovative setting, but with reference to networks, an active characteristic of a

cooperative enrichment of the local knowledge basis over incessant innovation relations such as cooperative learning could be identified (Lawson, 2000).

2.4.2 Collaboration and Innovation Management

When referring to the construction industry, collaboration is demarcated as an arrangement among professionals or experts to share their capabilities in a specific procedure in order to attain a considerable benefit to a project as a client or as public (Enegbuma & Ali, 2013). Similarly, Miles et al., (2006), defined that collaboration entails in a procedure by which several parties work intimately with other individuals to accomplish equally advantageous results. However, within construction industry, key challenges to effective collaboration is considerably as a result of independent working (Anumba et al, 1997).

However, in the perception of innovation management, collaboration involves a process where two or more different units or entities which are identified as individuals, teams, communities or organizations which generate knowledge and have a common aim of entailing in discovering or commercializing of a new product or a technology (Barbaroux, 2012). Accordingly, it is well articulated collaboration involves exchange of tacit knowledge between different levels within and outside the organization, specifically when organizations and managers who have required potential in the in terms of involvement with innovation are to be succeed (Miles, 2007). Furthermore, author stated that Establishing an atmosphere of entrust, grounded on trustworthiness, allows people to easily cooperate in the course of innovation, exchange implicit knowledge, and to generate novel knowledge from groupings and novel clarifications of knowledge segments each of which has. Thus, it has been identified by Barbaroux (2012) that the concept of innovation in the perspective of colloborative process require a specified knowldege transmission process and capable experise to concentrate on the propoerties of the social structure and the orgnaizational arranegemts aids to interactions among the individuals.

Thus, it has been stated by Maggioni, Nosvelli and Uberti (2007) that schorlars have studied on organizations with a netrwork-centric structure with special attention on innvovation performance. Additionally, specifing on the network properties such as cohesion, density, rate of interactions and centralization, (Cowan & Jonard, 2004).It

has been identified that specific means of collaboration are significant for organization and its associates to commercialize innovative products and facilities (Nieto & Santamaría, 2007). Consequently, over inter-organizational relations, active members over networks provides organizations with chances to advance their status in the in terms of short run or the long run (Thorgren, Wincent, & Örtqvist, 2009).

Furthermore, with higher number of network members, additional knowledge among members also increases, which optimistically impact innovative performance of an organization. (Knudsen, 2007). Innovation is thus perceived as the result of a collaborative procedure among the organization and its environment, or the collaboration among a varied number of actors, positioned in cooperation of inside and outside the organization (Mention, 2011).

Correspondently, adoptions include a pre-adoption activity, where the managerial or the governing party decides on the adoption of innovation with a post-adoption activity of implementation (Bozeman, 2000). According to Caiazza and Volpe (2016), this process involves several actors who involve in several activities to influence the specific industry or a region. Conferring to that Hassan, Mourad and Tolba (2010), identifed that lead user as individual who impacts the rate of innovation diffusion mainly through informal communciation and by prearranged networks and groups which boost the collaborations and diffusion of innovations.

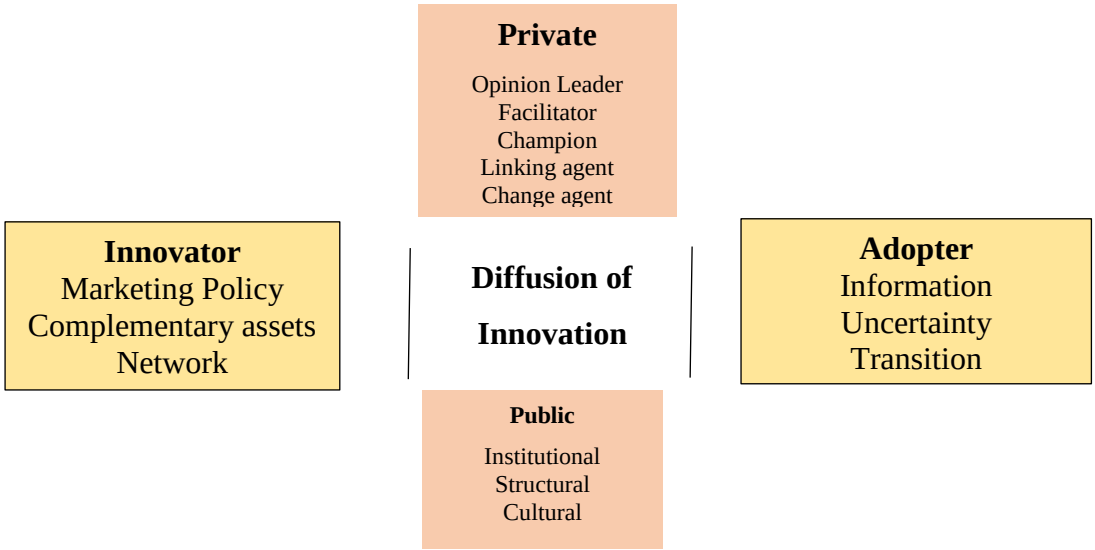

Figure 2.3: Actors and actions in the course of diffusion of innovation

Source: Caiazza & Volpe (2016)

It has been identified by Caiazza and Volpe (2016) degree of communication and interchange among technology developers and consumers then amongst consumers, organizational trustworthiness and management and characteristics of societal and cultural capital have been revealed to be enormously significant towards the formation of a cultural tendency towards dissemination of technology. Thus, the government could engage within the provision for understanding certain public–private joint project expected to commercialize novel technology (Caiazza & Volpe, 2016)

2.5 Social network characteristics and adoption of innovations

Along with the diffusion of adoption, many scholars have identified different path ways for the adoption of an innovation. Mainly four ways for an innovation adoption could be identified and they are described as follows. Thus, along with the informational trails in which network followers form a mode for flow of information regarding novel products and services. This information facilitates in the adoption over awareness and learning.

- In means of ***Awareness***, according to De Bruyn and Lilien, (2008) discusses basically to befalling attending to an innovation's presence. Evidently, social relations including discussions among people who are conversant with the product and others individuals with no awareness of the product and along with the individuals who are engaged in the act of boosting the awareness of the product.
- ***Learning*** of a product is a social procedure over which clients outline their opinions about the functioning of the product's features, value of it and extra charges they might experience, validity of the product along with the risk accompanied with the buying of it. (Acemoglu & Ozdaglar, 2011).
- ***Normative pressure*** identified by Van den Bulte and Wuyts (2007) in the setting of innovative product progress is the anguish felt by a latent adopter where he gets the consent of the peers but the specified individual is not. Hence according to Algesheimer, Dholakia and Herrmann (2005), normative pressure happens when social standards encourage a person to perform in a way opposing to his natural tendency.

- ***Network externalities*** relates to a circumstance in which functional usefulness of a product upsurges with the increase of number of adopters.

2.5.1 Effects of the social network structure metrics on an innovation's growth performance

Reich (2016) iidentified innovation propagation is identified as a "social process" and as confirmed by Acemoglu, Ozdaglar and Yildiz (2011) for the diffusion the structure of the society or else the network in which interactions occur is primarily important. Goyal (2007) as cited by (Devaud, 2008) specified numerous theories associated with social networks in several disciplines of sociology, mathematics, statistical physics, computer science, business strategy, geography, and organization theory. Nevertheless, the complicated development of social networks merging with heterogeneity of people presents the effort in recognising the impacts of the internal links and their significance on the diffusion procedure (Acemoglu, Ozdaglar, & Yildiz, 2011). A social network is defined as a "specific set of linkages among a defined set of persons, with the additional property that characteristics of these linkages as a whole may be used to interpret the social behaviour of the persons involved" (Mitchell 1969, p2).

In the representation of a social network incessant static relation are noticeable which might only occur among the individuals in closeness (Skyrms & Pemantle, 2000). Furthermore, Newman et al. (2011) specified structure of a social network growths in a way in which the role of the members and the patterns of performance they follow cannot be disregarded. Flow of information flow procedures in entirely casual networks are likely to be quick (Erdős & Rényi, 1959; Newman, Watts, & Strogatz, 2002), besides entirely linked networks are likely to presents the quickest procedures. Further as per Ofek, Libai, and Muller (2018). it has been identified that social value of a product of innovation initiates with the consumer's interface with other potential consumers, along with the purchasing of it and if they adopt the innovation (Ofek, Libai, & Muller, 2018).

According to Nair, Manchanda and Bhatia (2010), research on social networks are in the direction of measuring the performance of the network for the influence of individuals. Research on the development of innovations characteristically emphasis

on the degree centrality, closeness centrality, and betweenness centrality (Van Eck et al., 2011). However, combining the individual features and linking them to the global characteristics, would direct towards the high-performance growth of innovation. Thus, a summarized finding of a global characteristics and individual characteristics of asocial network is presented in Figure 2.4 and this study also accompanies with these identified characteristics.

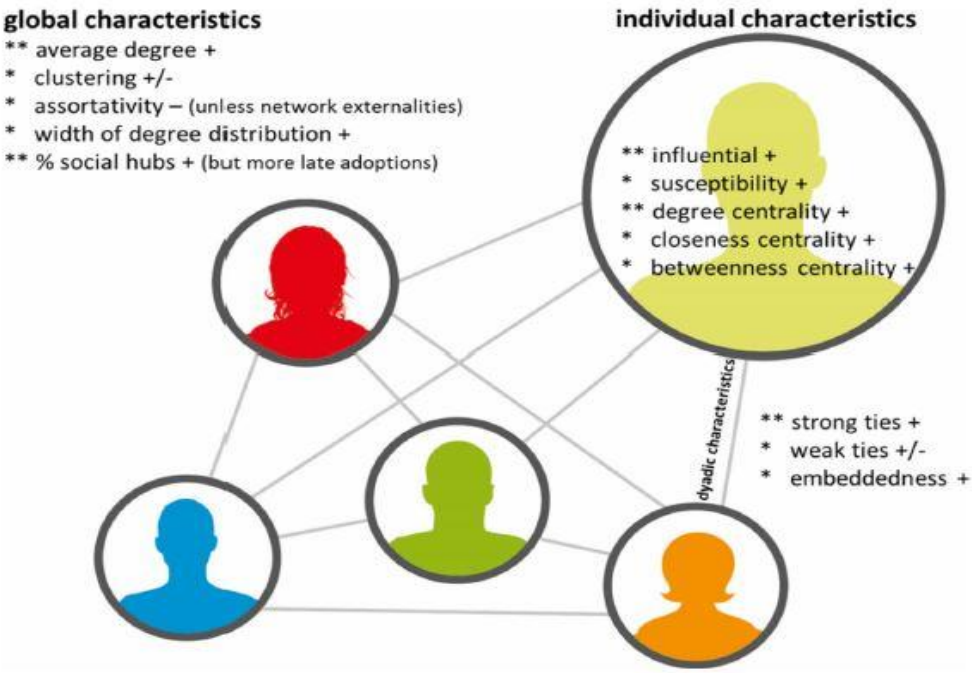

Figure 2.4: Structural characteristics of a social network which influence on the growth of an innovation

Source: Muller and Peres (2017)

2.6 Classification of adopter categories based on innovation

Rogers (2003) highlights in his process of diffusion, innovativeness to be an imperative component which explain on the degree to which a person's adoption is speedier than the other individuals, which included five categories of innovativeness. Furthermore, as elaborated by Rogers (2003), throughout the stream of process of innovation, primarily at the knowledge stage, adopters dealt with the recognition of degree of the innovation to adapt and the mode of utilization of it whereas in the persuasion stage dealt with consequences, pros and cons of the innovation. With the

surpassing on above stages the individual look forward on to adoption and rejection stage at where the decision is made on to accept or decline the innovation.

Figure 2.5: Characteristics of adopter categories based on innovation

Source: (Adopted from Rogers, 2003; Smith,2005)

In the above Figure 2.5 category of Early Adopters has been substituted by the term Opinion Leaders as per the author Smith (2005). The range of innovativeness is presently segregated to five adopter categories namely as innovators, early adopters, early majority, late majority, and laggards grounded on two features of a normal distribution which are identified as the mean and the standard deviation (Rogers 2003).

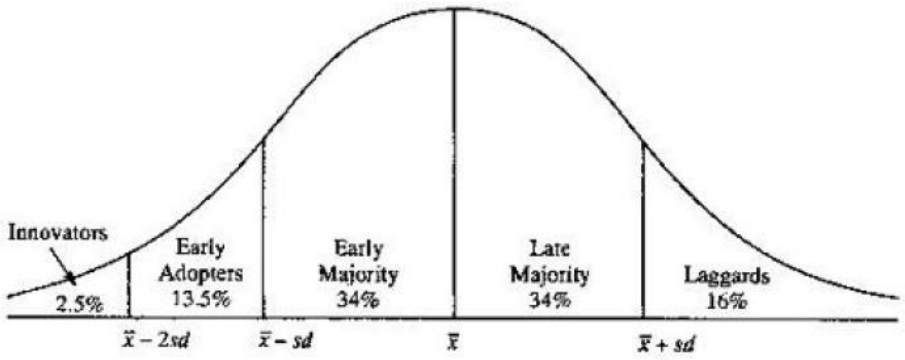

Figure 2.6: Adopter categories based on Diffusion of Innovation

Source: Rogers, (2003)

Rational approach has been applied to acquire a well perception of early adopters' motivation. Concerning the rational approach, forerunners come on to their conclusions with reference to information regarding the invention and the way by which it tallies with their organizational setting and aims of the organization (Fichman 2004). Nevertheless, early adopters make significant decisions on novelties although their advantages and disadvantages are still not evidently well-defined (Harrison and Waite 2006). The rapidity of diffusion of a novel technology hinge on the features of the technology the aforementioned, but then again with the features of the users of that particular innovation (Kavak and Demirsoy 2009, Teo et al. 2004).

2.7 Opinion Leaders

Inventive technologies allow leaders to origin within the people who primarily accept and implement the innovations while the fellow members track on the leader and attempt to go along with on their technological and organizational dominances (Koçak, Kaya, & Erol, 2013). Consequently, Koçak, et al. (2013) highlighted for the diffusion procedure of an innovation, the features of adopters or rejecters are vital along with the features of the innovation. For the diffusion of innovation, the adoption of innovation should be passed over the most relevant method for the effective adoption by the definite individuals .According to Turnbull and Meenaghan (1980) three characteristic methods for a certain social system to follow in the adoption of innovation were identified as the Theory of Random Selection, Opinion Leaders and the Trickle-Down Theory.

The phrase of opinion leadership was originally offered by the researcher Lazarsfield in the 1940s. Thus, Opinion leaders are identified as activists who impact others and engage in an intermediate role in the mass communication procedure where they would lay out the information to the community (Liu & Liu, 2018). According to Aghdam and Navimipour (2016) in recent years a greater concern has been given to studies on opinion leaders predominantly in sociological field.

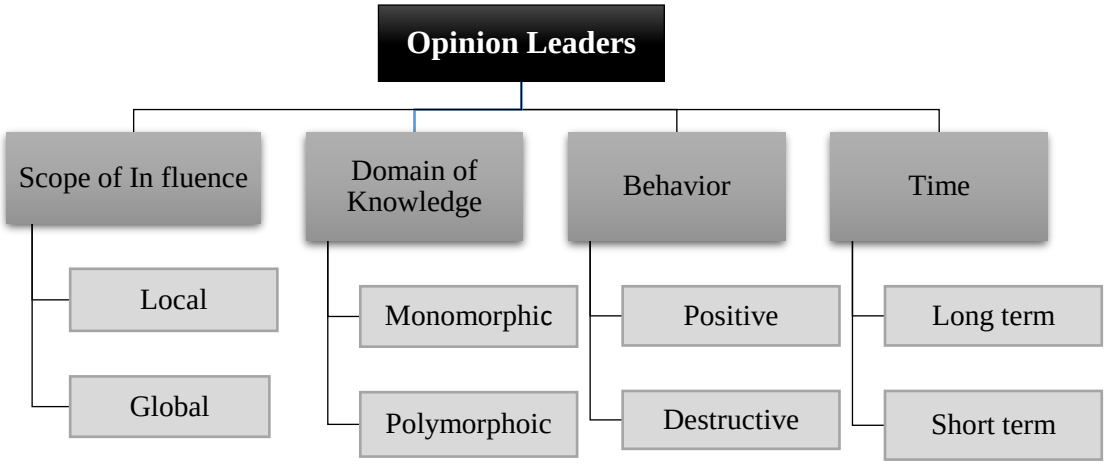

Figure 2.7: Categorization of opinion leaders

Within a social network Yang (2018) identified that opinion leader is a key node which could influence the opinion of public in the dissemination of information. Concerning to large scale and complex organizations, it has been identified that some individuals influence the others on the adoption and diffusion of innovation, who are identified to be opinion leaders (Tornatzky & Fleisher, 1990). "In a social network, opinion leader means the influenced person who may be an expert in a specific domain or have lots of people following his/her comments or ideas" (Chen, Cheng, & Hsu, 2016). Apparently with the extended view of Chen et al. (2016) Opinion Leaders are identified as information generators and message dispatchers who aware about media by a secondary communication. Thus, Rogers (2003) articulated an opinion leader as an informal leader who regularly impacts others' attitudes or performance. Opinion leadership could be due to the proactive exchange of information in a group which could be occurred in two-way flow of information (Gakhar & Chahal, 2016). Generally, as per Gupta and Rogers (1991) the opinion leader is amongst the primary adopters of novel products and practises word-of-mouth communication to encourage

the behaviour of other individuals in terms of exploration, buying and practise of novel products

In contradictory to above Harkola and Greve (1995) specified opinion leader do not inevitably always encourages a given innovation although it is likely to impact individuals' utilization decisions. However, Bamakan, Nurgaliev and Qu (2018) opinion leader's behavior correspondence with the organizational attitude to innovation.

2.7.1 Characteristics of Opinion Leaders

It has been identified through the past researches that several characteristics of opinion leadership are discussed and categorized into different sectors (Hassan, Mourad, & Tolba, 2010). Thus, this is reinforced by Rogers (2003) who verified that opinion leaders weigh against to their followers exhibit more innovativeness. Moreover, as per Goldsmith and Witt (2005), opinion leaders act like a role model where other followers could counterfeit them. Moreover, opinion leaders might persuade other customers to accept new novelties, where they ultimately influence the rate of diffusion (Rogers, 2003). According to the viewpoint of Schäfer and Taddicken (2015), opinion leaders use the incessant combination of formerly separate modes of communication in collaborative online media with special reference to the social media which simply emphasis the higher utilization of communication channels in the means of innovation dissemination. Hence it is important to identify their characteristics and they are categorize as shown below in Table 2.1.

.

Table 2.1: Characteristics of opinion leaders

External Communication			**Ref**
1	Higher contact with mass media than their followers.	I. Obtain their perceived capability by facilitating space for entry of new concepts into the community II. Exterior relationship might be offered through means of mass media, by an opinion leader's cosmopoliteness, or by connection with CAs.	1
2	More cosmopolite than their followers.	I. Have certain degree of cosmopoliteness which enable in driving innovative concepts to the social system from the exterior environment. II. Communicate information across the boundaries among groups. III. Perform as the agents within the groups not as the leaders of the group IV. Over the higher connections separately from social system limitations expand their knowledge on the innovation	1
3	Higher interaction with change agents compared to the followers.	I. CAs effort get interact with opinion leaders to influence diffusion activities; which unavoidably outspread the contacts among opinion leaders and CA than their followers	1
Accessibility			
4	Greater social participation than their followers.	I. Engage in wide-ranging interpersonal networks to communicate on innovation for their followers II. Shall be socially reachable as in social participation III. Casual discussion and organizational official meetings would influence on the emergence of new ideas	1
Socioeconomic Status			
5	Higher socioeconomic status than their followers.	I. Innovation generated at the lowermost positions require presence of supercilious promotions for the spread across in social system	1
Innovativeness			
6	More innovative than their followers.	I. Followers if required to be identified OP to be capable, knowledgeable and truthful, OP required to adopt novice concepts prior to their peers, II. Yet, OPs are not essentially to be innovators it varies on being innovative or not	1

		III. Earlier adopters of innovation	4
		IV. Seeking information	6
Personality Traits			
7	Public Individuation	I. Being OP, individuate themselves by superior knowledge and awareness in a specified thing than other pursuers II. Might extend an influence on the effectiveness in spreading information to peers	2
8	Less dogmatic	I. Might be considered as newer, with higher educational level, receiving higher revenue, and displaying greater social flexibility	2
9	Personal factors	I. Obedience towards customs of the society	4
		II. Higher interest and experimental behaviour	5
		III. Higher participation with product category	1
Sociological behaviours			
10	Personification of certain values	I. Convey key values of their social system and the followers want to follow up the OP.	3
11	Competence	I. Composite with capability in their respective field. II. Peers favour opinion leader to be knowledgeable, awareness or proficiency on the field.	1,3,4
		II. Experience and technical competence	5
12	Strategic social location	I. Ensure more tactical positions among followers in their social network	3
		II. Central to communication networks	5

Source: (Adopted from 1- Rogers, 2003; 2- Chan & Misra, 1990; 3- Aleahmad, Karisani, Rahgozar, and Oroumchian ,2015; 4- Goldsmith & Witt 2005; 5- Lyons & Henderson, 2005, 6- Eastman et al. 2002)

2.7.2 Communication channels among opinion leader

Weinstein, Hecker and Kincl (2007) elaborated on that significant emphasis on the peer to peer communication network is required for early adopters who already embraced the innovation and divergence to above fact within the social structure if the specified innovation is not adhered direct communication among the followers and the CA would facilitate in a successful dissemination approach. Moreover, reinforcing the above fact Bodendorf & Kaiser (2009) OP position along with their communicational conduct impact upon the opinions of individuals within the SN while establishing a platform for individuals to gather required information.

2.7.3 Homophily and heterophily in communication networks

The perceptions of the "homophily" was specified to by the researchers and their definitions where by as per Rogers (2003) it is the degree that two persons communicate in a parallel manner opposing to "heterophily" where two people interact in different convinced attributes. Homophilic actions and their corresponding heterophilic procedures accordingly culminate the features of a group and relate them to social actions along with consequences of them (Lozares, Verd, Cruz, & Barranco, 2014). The frequency of homophily in communication networks guides to an alternate classification of opinion leaders as being parallel in their socio-economic features to the followers (Feder & Savastano, 2006). Still as explicated by Rogers (2003) homophily could be an unobserved hurdle in the diffusion of innovation within a social system. However, more heterophily within a network could only use lesser number of opinion leaders with higher socioeconomic status. In respect to the above fact Turnbull & Meenaghan (1980) recognised information flowed from the mass media to influential individuals within the community and that these influential individuals or opinion leaders were a significant influence for more submissive groups within the community to reach them.

Figure 2.8: Concept of two flow communication

Source: (Turnbull & Meenaghan, 1980)

A change agent (CA) is an individual who impacts clients' innovation-decisions in a way considered to be desirable by a change agency (Rogers, 2003). Additionally, Turnbull and Meenaghan (1980) specified the two-step flow of communications or word-of-mouth advertising is founded on the perception that certain persuasive individuals in a community from another area of the society who are in the procedure of information flows. Consequently, the Figure 2.8 embodies the concept of two flow of communication where the opinion leader act in the midway position of the communication flow persuading a mass group to follow on a specific innovation.

2.7.4 Opinion leader detection approaches structure

Detection of an opinion leader inside a social network who submerge in the diffusion process would be vital on dissemination of innovation (Valante and Pumpuang, 2007). Furthermore, author stated that the selection of the most relevant technique to detect opinion leaders would be based on the situation, accessibility to suitable opinion leaders, resource approachability and with the expected responsibilities of the opinion leader. However, more complex methods recognised as network analysis were established later, dependent on the prearranged approaches for determining communication tactics in a society (Valente & Davis, 1999). However, all the identified methods permit a score-based incessant index of leadership, then require contact on respondents who could be talk to reliably in means of opinion leadership and bring information on the collections and networks of communications. (Feder & Savastano, 2006).

Table 2.2: Methods, techniques and instruments for identifying opinion leaders

Methods	Techniques	Instruments
Celebrities	Employee renowned individuals who are nation-wide, regional, or local personalities	Media or individuals identify
Self-selection	Volunteers are enlisted over solicitation	People volunteer for roles of leadership
Self-identification	Surveys use a scale of leadership and those keep score above certain threshold are considered as leaders	Once a person cooperates with equals, whether that person give or receive advice
Staff selected	Leaders selected based on community observation	Staff decides which people seem to be an opinion leader
Positional approach	Individuals who inhabit leadership roles such as priesthood, designated administrators, media, and business leaders	Whether the individual is a designated person or have role in leadership Being a member of any public organizations.
Judge's ratings	Well-informed public members recognise leaders	Individuals who are well educated and informed recognize leaders to be nominated and rate all public members on leadership capability

Expert identification	Qualified ethnographers learn about societies to recognise leaders	Participant viewers look on to contacts inside the public and decide who individuals look for advice
Snowball method	Index cases offer suggestions of leaders who are then cross-examined till not any new leaders are recognised	Randomly or conveniently nominated index cases are inquired who they look for an advice Those designated or a random selection of those nominated are similarly questioned with this question
Sample sociometric	Randomly identified respondents recommend leaders and those identified regular choices are selected	Randomly selected sample or cases are questioned who they look for an advice
Sociometric	Entire or most of the respondents are questioned and those in receipt of frequent nominations are selected	All respondents are questioned who they look for an advice

Source: (Valante & Pumpuang, 2007)

2.7.5 The Roles of opinion leaders in the Diffusion of Innovation

The role of opinion leader is critical in the effective dissemination of innovation in a community or a firm as their act or influence is induced by the followers in their adoption of innovation. Hence Ming Yu (2002) emphasized that role of opinion leader is required in inducing others personal interest for sharing of knowledge where opinion leaders have an important role to interconnect and influence the followers share knowledge in order to perform well in carrier along with personal development while improving their personal recognition in the organization. Subsequently, Havenga, (1974), the personal encouragement of opinion leaders is very vital in the convincing stage of the innovation decision process and they use innovation into the practical usage and thereby make the judgment for its further implementation.

2.8 Innovative concepts relating to Quantity Surveying

Seeley (1997) stated Quantity Surveying is a profession who engage in preparation of precise Bill of Quantities (BOQ) to be estimated contractors in the tendering process and Engage in the measurement and valuation of variation occurred during the period of construction. Nevertheless, in present context for quantity surveying has been

changed along with the rapid economic development and technological enhancements (Chong, Lee, & Lim, 2012). Considerably, many researches gave been conducted over the changing aspect of the profession of quantity surveying (Fellows *et al*., 2003; Hardie *et al.*, 2005).

Subsequently, with respect to Australian context as per Hardie *et al.*, (2005) quantity surveyors who has the higher potential for successful innovation has the had a impartial result on profitability where they identified that there is a general inclination for quantity surveyors to be deliberate adopters of innovative knowledges. The suggestions are that the profession of quantity surveying required to be additionally positive in encouraging the technological and structural novelties that are presently being established (Hardie, Miller, Manley, & McFallan, 2005). According to Page et al. (2004) an emphasis on quantity surveying directs the core of invention research away from production and manufacture in the direction of the knowledge intensive distribution of professional services.

Additionally, Reddy (2015) identified that value addition for projects, manual measurements from transformation for Computer Aided Design (CAD), innovative developmental approaches are identified to be revolutionary aspects in the field of quantity surveying. Furthermore Martin (2009) illustrates that eprocurement is similarly executed within Quntity surveying organztions irrrespective of its lesser usage within organizations. Sutrisna, Buckley, Potts and Proverbs (2005) explained that, for QSs it is vital to regularly engage to develop and continuously advance themselves and enhance their professional involvement to the field. Mainly with IT and CAD quantity surveying field has been upgraded while reducing the difficulty twisted in traditional applications over the practice of BIM, Cost X, AutoCAD and Revit Architecture (Ward, 2016). CAD interface and co-operative project administration are identified to be novelties that give substantial potential to quantity surveyors in concern to improvement of productivity (Lowry 2004). Hitherto, Frei, Mbachu and Phipps (2013), specified that QSs must follow up proficiency in their fields, to be outstanding in their work and follow up the up to date developments in IT, knowledge management and strategic change management, involve in innovation and problem solving and social skills with networking for global reach. Thus, it was evident that inability to change in terms of Information Technology would extremely

influence the success of the Quantity surveyors (Shen *et al.*, 2003; Smith, 2004). Currently, several commercially advanced software packages are directed at supporting the operation of quantity surveying responsibilities (Odeyinka, 2008). Table 2.3 illustrates the identified innovations and their remarks in the field of Quantity Surveying.

Table 2.3: Identified innovations in the field of Quantity Surveying

	Innovation	Remarks	Citation
1	*e-procurement*	there is possibility for huge savings within construction with the implementation of e-procurement	*Eadie R, Perera S, and Heaney G (2011)*
		less than 20% of the Quantity Surveying organisations uses e-procurement. Organisations encouraging themselves electronically were further probable to practise electronic procedures of procurement as the where it designated only a minor intensification to 25% for Quantity Surveying associations. The normal adoption rate within the industry is 27%, where government is more probable to adopt e-procurement in United Kingdom.	Martin J. (2009).
2	**BIM**	**5D BIM** Identified several barriers such as absence of software compatibility; high-priced set-up budgets; a absence of protocols for coding objects in building information models; absence of an electronic guide for coding BIM software, and the absence of integrated models, which are an vital intial requirement for full inter-operability which is required for collaborative working, in the industry.	Stanley, R. and Thurnell, D. (2014).
		Low adoption among quantity surveyors is due to lack of awareness of the potential of BIM application toward their profession. Quantity surveyors are unsure of the capability of BIM in their practice.	(Phui Fung, Salleh, & Mohd Rahim, 2014)
		For Quantity Surveying (QS) profession, BIM presents huge challenges and opportunities, particularly in the area of cost estimating and quantity take-off. Use of Solibri Model Checker 8 • Autodesk QTO 2012 • CostX 3.5 • BIM Measure 16.4	(Wu, Wood, Ginige, & Jong, 2014) Kherun N. Ali, Nur E. Mustaffa, Quek J. Keat, Wallace I. Enegbuma (2016).
		BIM integrated core quantity surveying responsibilities like cost estimating, tendering, and development appraisal into high profile BIM projects.	Pittard, S., & Sell, P. (2017)
		Automated through BIM use is quantity takeoff (QTO). BIM tools contain routines to perform calculations using the element's geometric properties and provide spatial quantities like area and volume in text form	Monteiro, A., & Poças Martins, J. (2013).
		Quantities from a Building Information Model can be extracted to a cost database or an excel file.	Kulasekara, G., Jayasena, H. S., & Ranadewa, K. A. T. O. (2013, June).
		BIM tools are capable of automating the tedious task of quantifying, they allow the estimators to dedicate their valuable time on other cost sensitive tasks as pricing and factoring risks.	Autodesk, 2007.

		reliability of cost estimates can be improved through the implementation of BIM technology. Improved information, especially through its data visualisation, reliable database and data coordination, as the significant input in estimating construction costs, is among the valuable assets BIM can deliver to potentially improve quantity surveying practice; also, being able to compare models as they developed or changed.	Ismail, N. A. A., Drogemuller, R., Beazley, S., & Owen, R. (2016).
3	New Rules of Measurement (NRM)	Accordingly, a new set of rules known as the New Rules of Measurement (NRM) was drawn up in three separate volumes in 2011 to be applied at various stages of the construction process from early feasibility to building occupation through completion and handover (Cartlidge, 2011).	Song Wu, Gerard Wood, Kanchana Ginige, Siaw Wee Jong (2014). Cartlidge, D. (2011).
4	SMM7	Industry practices have largely depended on the use of Standard Method of Measurement (SMM) to obtain the detail project costs in the form of BoQ during tender estimation. SMM has been in use since 1922 to provide quantity surveyors a uniform set of rules and guidelines for measuring and pricing building works	Matipa, W. M., Cunningham, P., & Naik, B. (2010, 6-8 September).
5	BOQ related software	BuildSoft, Binalink, Masterbill, CatoPro, CostX, Ripac, QSPro, WinQS Buildsoft specializes in takeoff software, construction estimating software, preparation of bill of quantities, electronic takeoff as well as hard copy takeoff through the use of digitizers. Assist quantity surveyors enhance their estimating skills in innovative ways to speed up their takeoff whilst also saving time and money in the preparation of the bill of Binalink product range includes Binalink BQ Module and BinaLink CAD Measure. Binalink BQ Module prepares BQ and lump sum BQ in single and multiple column formats. BinaLink CAD Measure with taking off capabilities from CAD drawings by automated or manual measurement methods for plan area, perimeter, vertical area, vertical partition and lineal measurement Masterbill3 is the complete BQ production system, fully featured and including pricing, cost analysis and tender comparison routines. It has user-defined BQ formats and layouts that allow the user to create a BQ at any point in the measurement process (Masterbill website, 2011)[9].	Keng, T. C., & Ching, Y. K. (2012, January).
6		AutoCAD	Saleh, M. A. E. (1999).

2.9 Encouragement of use of innovation among Quantity Surveyors

Frei, Mbachu and Phipps (2013) identified threats to quantity surveying which initiates from different areas including, economic, technology and globalisation. Thus, authors specified that QSs must deviate from their traditional role and to be adjusted to face up the revolutionized construction sector where in terms of technological advances, absence of inclusive shared knowledge on Information, communication, technology is highly concerned Thus Hardie, Miller, Manley and McFallan (2005) identifed with his research that several steps could be taken in order to encourage innovation among

quantity surveyors. It included upgraded training and information programs, top practice demonstrations, employment of skilled people, supportive organizational mechanisms including a financial, technological, constructional, organisational and behavioural nature and more association between quantity surveyors and other construction professionals.

2.10 Summary

The concept of diffusion of innovation is essential for the transmission of innovations concerning on to different attributes of the innovation. The literature survey emphasises on the critical factors for the diffusion of innovation and how it differs corresponding to individual adoption and organization adoption of the innovation. Thus, Rogers have identified types of innovation along with the attributes of the innovation. Hence, it is further emphasised that Opinion leaders are required in the effective adoption of innovation and the knowledge management and innovation management within the social network is highly influenced by the characteristics of the social network.

3.0 METHODOLOGY

The chapter is focused on depicting the systematic approach carried out to unravel the research problem. Initially the research problem was identified. Subsequently, chapter reveals the research approach, research techniques including data collection and data analysis. Thus, the chapter denotes the methodology to be carried out to accomplish the research aim.

3.1 Research design

The framework carried out for the research in order to achieve the research aim and objectives is illustrated as follows.

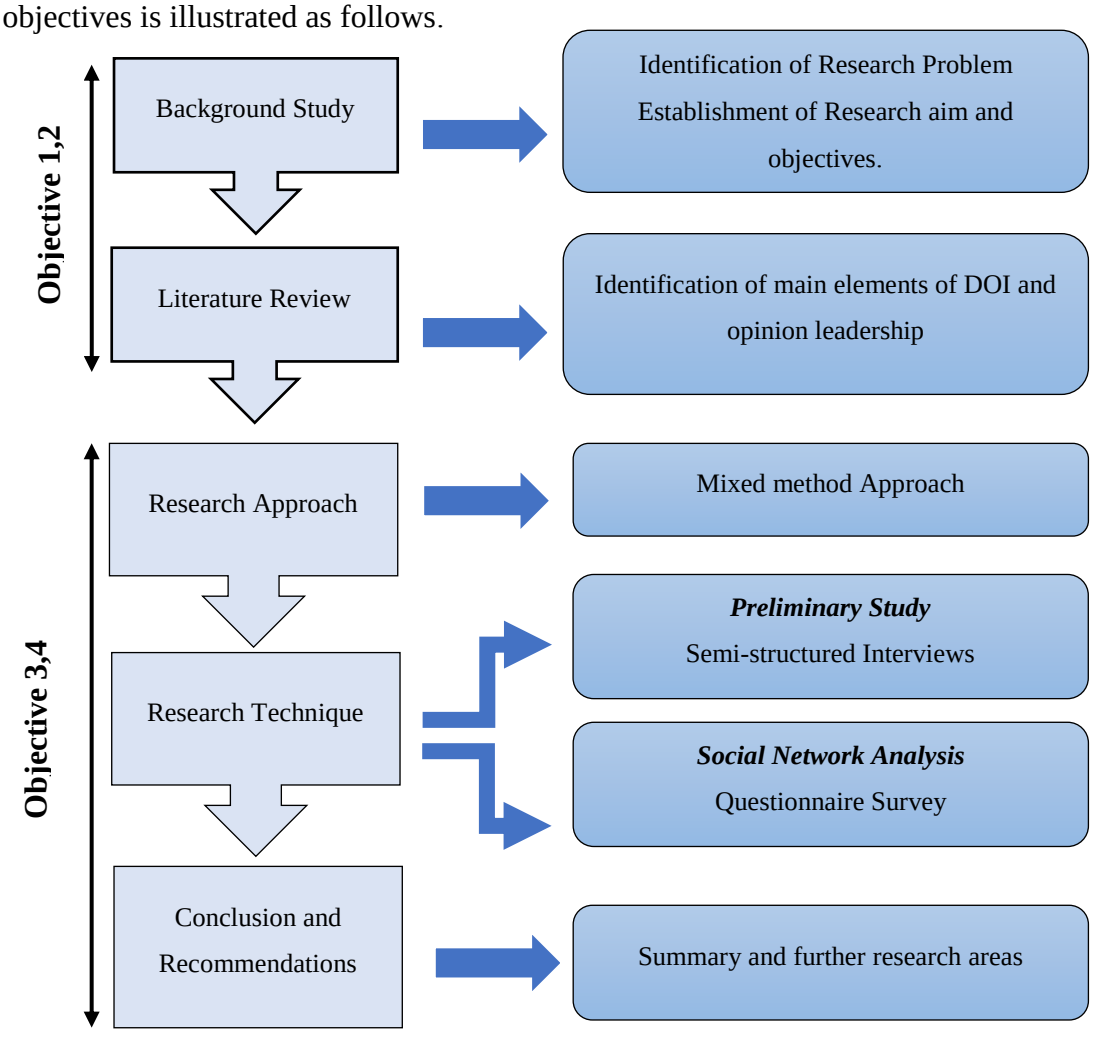

Figure 3.1: Overall research procedure utilized for the conduct of study

3.3 Research Approach

Research approach could be identified under two comprehensive general groupings as qualitative and quantitative researches. Research designs based on in qualitative research are more suitable for exploring the discrepancy and multiplicity in any feature of social context which include qualitative data, while quantitative researches are well-matched to discover on the degree of this dissimilarity and multiplicity with the use of quantitative data (Kumar, 2011). As per Crewell (2014) the mixed approach uses the amalgamation of qualitative and quantitative approaches and delivers a comprehensive interpretation of a research study than the individual use of qualitative or quantitative approach.

Initially, a preliminary study was conducted to identify the current usage of innovations identified within the Sri Lankan context and then to identify their interest on novel concepts yet to be adapted in their practice. This preliminary study based on Qualitative approach aided in identifying the innovations to be taken in order to develop the Social Networks among the Quantity Surveyors.

It has been identified by Williams and May (1998) the usage of scientific approaches for data collection and analysis results in the possible generalization where the explanation of research findings essential not be understood as a simple coextensive nature. Additionally, qualitative approach facilitates the control and study groups. Which would enable in reaching out to the targeted or random groups based upon the research problem. (Johnson and Christensen, 2012). A complete control over the replacements such as clarifications, descriptions, and conclusions could be obtained where the objectivity of the researcher would not be conceded. Furthermore, this may perhaps guarantee respondent anonymity (Creswell, 2014).

According to Edwards (2010). networks are plotted and measured through quantitative approaches where social relations were converted and abridged into numerical data irrespective of the presence of the ties. Social Network Analysis (SNA) has advanced as a technique aimed at reviewing ‘social relations’ rather than ‘individual attributes’ (Burt 1978). SNA offers the both qualitative and quantitative, approaches in identifying networks of people, entities and their level of strength in the linkages (Wolfe, 1997). Loosemore (1998) specified upon the fact of usability of SNA as a quantitative approach amidst of an explanatory background. Thus, in order to signify the properties of the social network among QSs the quantitative approach of SNA is

utilized deriving at interpretations on the statistical values on the properties of the network. It has shown that social network analysis can be used to identify opinion leaders where network data can be analyzed to identify central actors in the network who also tend to be opinion leaders within that group/community (Van der Merwe & Van Heerden, 2009). The modification of networks to improve communication flow between organizations and different stakeholders (Cross, Borgatti & Parker, 2002). It is this possibility of multiple applications that makes the use of social networks so attractive.

3.4 Data collection

Initially data collection was carried out as the first step under research technique where in this study two different approaches were considered on achieving the research aim.

3.1.1 Preliminary Study for the identification of current innovation practices within Sri Lankan context.

The main aim of this preliminary study is to identify the current innovative practices among the Quantity Surveyors. Thus, this enabled in order to recognize the current context at which the social networks would be developed. Thus, an expert survey was accompanied to collected information of the innovative concepts where information on the current innovation which are practicing and their duration of practise and their connection in the perceived attributes of innovation were studied. Thus, this enabled to identify the most appropriate and applicable innovations to be concerned when developing the social networks.

3.1.2 Survey for the identification of social networks among Quantity Surveyors.

Data collection depends upon the use of analysis method where as in the approach of SNA the types of data varied along with the style of research, source of evidence and type of analysis as per the elaboration given in Figure 3.2.

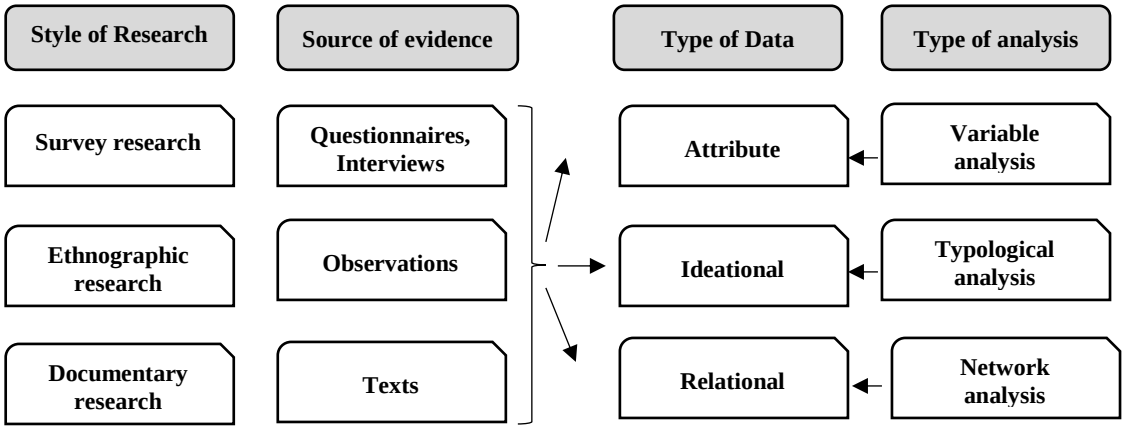

Figure 3.2: Types of data and analysis applicable in Social Network Analysis

Source: (Scott, 2017)

As further elaborated by Scott (2017) relational data are considered within the sociological practice to elaborate on a SN structure which is built upon on linkages simply facilitating in the collection of data. The Figure 3.2 further elaborate on the SNA in means of data utilization. Hence, questionnaire survey was conducted aiming to identify the social network among Sri Lankan QSs limiting up to communicational network. Data collection conducted through socio metric method which further narrowed down to sample socio metric method It was identified as the most apposite method for narrowing down the social network to locate opinion leaders among the QSs of Sri Lanka in terms of SNA along with the merits of the technique. Socio metric method enables in preceding toward the ultimate objective to identify opinion leaders through SNA, where it can be collaboratively used to accomplish objective 03 and objective 04. According to Kim (2007) data from socio metric method is applied for the research in novice applications, Thus, the method is suitable for the research as it considers the new practices in Quantity Surveying field.

The sample selected by the researcher included Quantity Surveyors employed from the western province, where their communicational network was identified through

asking questions on opinion seeking about the computer software including AutoCAD and CostX along with the usage of New Rules of Measurement from the professionals of QSs. It was required to consider a specific innovative approach within the field to locate the opinion leaders. Namely, relative advantage, compatibility, complexity, trialability and observability according to Rogers (2005) were identified as five perceived characteristics of innovation. Therefore, the study utilized quantity surveying computer software and New Rules of Measurement as it accomplishes the above five perceived characteristics of innovation. This tally with the current context of the Sri Lanka as per the results obtained from the preliminary survey (Chapter 4) was utilized to identify the above three innovations corresponding to the results of the experts.

This recognition and ascertaining of opinion leader necessitate a reliable investigation of social composition of the society and as opinion leader stimulate followers through their personal contacts, it is vital to analyse their communicational network (Kim, 2007). The survey was conducted with specific questions which resulted in limitations on the network thus applying the socio metric method. The sample was limited as method itself only consider a sample from the whole population. Thus, with the geographical limitations and aiming at locating the opinion leaders among whole population is considered sample is most apposite.

3.1.3 Identifying opinion leaders in the field of Quantity Surveying.

According to Rogers (2005) opinion leaders are located through the measurements of degree, betweenness, and closeness among which degree centrality is considered as the significant measure since opinion leaders frequently have higher involvement and social availability compared to others. Therefore, this research considers above procedure in identifying opinion leaders within the social network enabling in the construction of composition of the respondents for the interviews.

3.5 Data analysis

Data analysis carried out in the means of quantitative approach to reach out at the aim of the study.

- **Analysis of the properties of social network**

According to Haythornthwaite (1996) Social network analysis (SNA) is a method and include set of procedures facilitated to study the conversation of resources between actors (i.e., individuals, groups, or organizations) which is identified to be information. Usage of SNA in the interpretation of the social network s is productive as it illustrates the consistency and the nature of the social network through all the basic characteristics of it. Underpinning the above fact for the identification of social network among QSs UCINET software was used which is commonly used by many researches in their studies specially within the construction field (Chinowsky, Diekmann, & Galotti, 2008) which facilitates in understanding the nature of the social network. Therefore, the research also utilized the UCINET software in order to arrive at the identifying of interactive nature among QSs

- **Analysis of the Opinion Leaders in the field of Quantity Surveying.**

According to Rogers (2005) opinion leaders are located through the measurements of degree, betweenness, and closeness among which degree centrality is considered as the significant measure since opinion leaders frequently have higher involvement and social availability compared to others. Therefore, this research considers above procedure in identifying opinion leaders within the social network enabling in the construction of composition of the respondents for the interviews. The following parameters were utilized for the analysis of the structure of the networks derived and status of each actor within the social networks

Table 3.1: Parameters for the analysis of the social networks

Measures of Cohesion	
Network Density	The percentage of genuine nominations amongst the entire conceivable number of nominations.
Actor Degree	No of ties in the social network
Reachability	The availability of any contacts in dash from The effect of social networks structure on innovation performance: A review and directions for research. source to the required actor or the node regardless of any actors or nodes halfway of them
Point Connectivity	The number of nodes or actors that would have to be detached for an individual actor or node would not be capable to grasp another.
Geodesic Distance	The length of the Geodesic path or shortest path
Measures of Centrality	
Degree Centrality	Amount of ties an actor or anode accompanied when related to other actors or nodes within the social network
Closeness Centrality	Evaluate the how nearby an actor or a node is to other individual actors or nodes in the social network.,
Betweenness Centrality	Evaluate the degree to which an actor or a node is an imperative intermediate among other fellows' contacts in the social network.

Source: Adapted from Muller & Peres (2019)

3.6 Summary

The research procedure carried out in the achieving research aim and objectives was elaborated throughout this chapter. In order to reach to the aim of the research mixed approach was utilized as it corresponds with the ultimate output of the research in identifying the nature of social network and opinion leaders and followers among QSs of Sri Lanka. The collected data were analysed through identified computer software UCINET which presented the composite product of the research.

4.0 RESEARCH FINDINGS AND DATA ANALYSIS

The research aims to identify the nature of the social system on which actors could collaboratively engage in the process of innovation. The chapter four represents the collected data and their analysis which was undertaken to accomplish the objective 03 and 04. After a preliminary study, a questionnaire survey was conducted in order to the derive three social networks corresponding to different innovations among Quantity Surveyors. The main intent of the study was to identify the nature of the social networks and the behaviour of the actors in terms of the diffusion of innovation through Social Network Analysis.

4.2 Preliminary Study Analysis and Findings

The preliminary study aided in the identification of current practices among several Quantity Surveyors on whom were interviewed identifying the innovations within their personal usage as well as organizational usage. Thus, following results were obtained and based upon that innovations to be considered to derive the Social Networks were identified.

Table 4.1: Composition of the respondents in the preliminary survey

No	Respondent	Designation	Type of Organization	Industrial experience	QS related innovative practice	Years of practice	Innovative concepts likely to be followed
1	N1	Senior QS	Consultation	17 yrs.	AutoCAD, CostX	7 yrs.	e-procurement NRM
2	N2	Senior QS	Contractor	13 yrs.	CostX, AutoCAD	5	NRM
3	N3	Senior QS	Consultation	17 yrs.	CostX, AutoCAD	7 yrs.	NRM
4	N4	Managing Director	Consultation	27 yrs.	CostX, AutoCAD	7 yrs.	e-procurement NRM
5	N5	Managing Director	Consultation	16 yrs.	CostX, AutoCAD	7 yrs.	NRM
6	N6	Managing Director	Consultation	13 yrs.	AutoCAD	13 yrs.	NRM

Hence, it was apparent that, all the respondents were familiar with the use of AutoCAD and their usage has been generalized with their organizational usage. However, CostX was not considered and used by one of the respondents as the organization level itself

is not in the status of accompanying that due to financial inability. Nevertheless, five of the respondents are utilizing CostX within their organization along with their employees and have a sound knowledge regarding that. However, they limited identifying themselves with other innovative concepts but have an eagerness to use the e-procurement and NRM with the applicability in the working context if they are required. Although their current usage of NRM is very limited but their interest of use them emphasized their eagerness in the innovation adoption.

Consequently, in order to develop the social networks AutoCAD is selected as it is recommended by all the experts and it is generally fully dispersed in Sri Lankan context while CostX is moderately used and within Sri Lankan context corresponding to Wester Province while NRM was selected as the third innovation since it is not yet completed adopted or diffused but the respondents showed an interest in adapting them.

4.3 Data Collection for the formation of social networks

In order to reach the objective 03 and objective 04 of the study, data was collected through a questionnaire survey which enabled in the development of three social networks.

4.3.1 Questionnaire Survey for the plotting of social networks among quantity surveyors.

The survey was conducted to identify the nature of social network among Sri Lankan Quantity Surveyors grounded on their communicational network questioning respondents to list three (03) names of Quantity Surveyors whom they look for opinions (better ways of doing) in respect to the field of quantity surveying in the use of the software namely AutoCAD, CostX and the use of New Rules of Measurement. Abovementioned questionnaire survey was directed through the sample socio metric method as it aided in detecting Opinion Leaders through creation of Social Networks of the three of each identified innovation where the sample of respondents were limited to QS from the western province.

In order to attain at a higher responsive rate, most of the questionnaires were filled with the aid of telecommunication. Additionally, in order to attain at a square matrix to enable sensitivity to measures of Social Network properties the responses were harmonised among the responses of the questionnaire. Initially 37 responses were obtained and further networks were developed until a cohesive network were obtained with the data collection form the resulted respondents of 77 at the end of data collection process. Thus, the profile of the responses rate is depicted in Table 4.1.

Table 4.2: Response rates for the questionnaire survey

Total number of questionnaire sent/distributed	117
Number of responses received at initial stage	37
Number of responses confirmed for the completion of data structure	40
Total number of responses	77
Rate of Response in terms of the field of practice	
Consultants	33
Contractors	44
Years of Experience	
Less than 5 years	32
5 years - 10 years	18
10 years - 15 years	16
15 years - 20 years	7
Above 20 years	4

4.3.2 Analysis of the findings and discussion

For the data analysis, Social Network Analysis was adhered where three social networks were developed through the UCINET software and their measures of centrality and measures of cohesion were studied. The three social networks were developed based upon their channels of communication where the actors are presented by the nodes in the network and they were interconnected based upon their information

passage over three different innovations. Additionally, though the measures of centrality the, significant nodes who are known as Opinion Leaders we further identified.

4.4 Analysis of the Social Networks derived from the UCINET software

Referring to the analysis of the social network, the properties of the social network were analysed which reflected a clear indication of the structure of the network, relations among the actors and the positioning of the actors relating to innovation diffusion on three different innovations namely AutoCAD, CostX and New Rules of Measurement application. The following content directs the study of SNA of the Social networks among the Quantity Surveyors.

4.4.1 Levels of analysis, types of ties, and types of relationships within the social networks

A quantitative approach with the aid of Social Network Analysis, was based in which following attributes were identified significantly. The level of analysis is the individual base at which three communication networks were built upon developed on the basis of response towards the three defined innovations in the field of Quantity Surveying.

Through the mined data over the questionnaire survey, the three social networks were developed over the relationships of the actors within each network. The basis for their relationships were developed through their seeking f opinions or better ways of doing or acquiring the knowledge of the identified three innovations separately from the other Quantity surveyors who re engaged in industry practice in which while mode of data is from people to people.

4.4.2 Development of the data structures for the data analysis

Data collected through the questionnaire survey was arranged to develop the data structure in the form of a square array of data with the use of MS Excel. The columns and the rows identify the individual actors identified within a social network where sample is used for the development of the three networks and each actor is identified by a unique name. The data is presented in a two dimensional or square structure which is binary and symmetric in nature. The communicational relationships are defined

through the matrix structure in which rows present the individuals who are in search of information while the columns represent the individuals who are disseminating the information. Basically, the overall structure presents the communicational linkages on how they seek on opinions and advice to engage in the best way in each identified innovation of the study. Actor on each row has indicated three individuals who they are seeking advice on the quantity surveying related innovation and based upon that the actors in the columns are arranged. The completed data structures used for the analysis is under the Appendix A presented with 77 actors and their connectivity with each other in three data structures.

4.5 Network sizes of the derived social networks on the identified innovations among Quantity Surveyors

The resulting social networks though the UCINET software is composed of 77 actors in each representing their paths of information seeking and information disseminating. The network represents the actors through the pre-determined nodes, where size is given by all the probable number of contacts with the real number of contacts within the social network. In respective to the derived networks of the identified three innovation the number of actors is equal which is 77. The unique number of ordered pairs within the network is 5852, where it is gained through the multiplication of number of actors in the whole network by number of actors minus one actor. Thus, the connections among and two actors would be considered differently in their two-way communication, through the asymmetry of the connections among the actors. Thus, all the possible connections would be considerably increase with the increase of actors in the network where considering the whole population the probable interactions among the actors would be increased which impacts upon a higher information collaboration among the quantity surveyors.

4.6 Identification of nature of social network in respective of the AutoCAD/Auto Desk usage among Quantity Surveyors

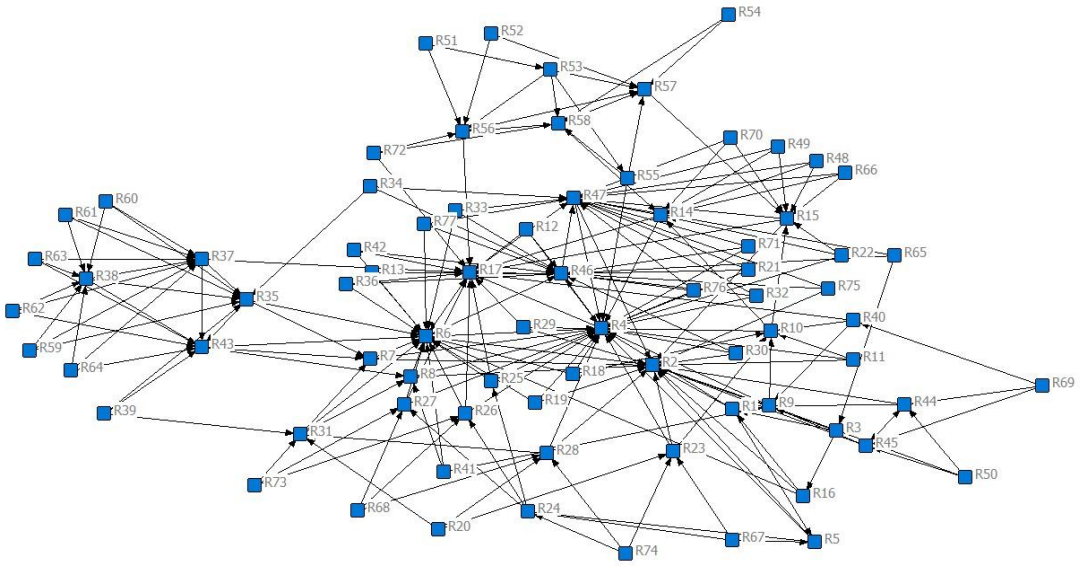

Figure 4.1: Derived Social network among quantity surveyors in respect to the innovation of AutoCAD software

4.6.1 Actor Degree

The derived universal statics obtained the UCINET software in represented in the Appendix E (I) depicts the behaviour of each actor upon other actors as a source of tie. According the derived statics it is highlighted that actors R4 and R6 are prominent in contributing information to the social system in terms of AutoCAD software as they have a higher SSQ value of 26 and 21 respectively. Considerably, R2 and R17 with SSQ of 18 along with R46 and R47 with SSQ of 17 are emphasised to be protentional information contributors in terms of the software where they dissemination knowledge and information to the social network. Thus, it specifies that nods with higher number of ties act as sources of information to the others and they have a sound knowledge on the AutoCAD software. Additionally, with their greater ability to connect with people and having them identified to be information distributors their impact upon the social network could be positively used for its upliftment in means of innovation diffusion. Furthermore, moderate information diffusers in respect to the other actors could be identified as R14, R15, R35, R37, R43 with SSQ value of 7 and R56, R57, R58 with SSQ value of 6 where they are prominent among few number of actors based upon their proximity and organizational environment, where people seek information from

them and by expanding their communication network and highlighting them to be potential information distributors would expand the information diffusion network. Substantially, nodes indicating low value of SSQ represents that actors have a lesser number of ties or connections with the other actors where they are not identified to be influential characters in the social system. Hence, their knowledge diffusion of AutoCAD software on others are minor and they are keen on acquiring knowledge or they are steady with their current knowledge level of the AutoCAD software.

Henceforth, this evidently specify in the QS's social network numerous entities perform as a foremost character on the diffusion of information and the views whereas lot of individuals solitary search for information. Moreover, nodes with comparatively less SSQ ranging in the lower level indicates they are not in the process of disseminating information and other actors are also not in a tendency to reach them for the information with respect to AutoCAD software.

4.6.2 Reachability

UCINET results analysis on the cohesion of the social network signifies the possible interactions among the actors in terms of reachability. Leaning to the depicted results of the Appendix E (II) it is significant that in terms of AutoCAD software knowledge diffusion, a lesser number of actors are notified to be reachable within the quantity Surveyor's social system. It is emphasized that there is a portability that in the same basis, where all the actors cannot act as information seekers and information disseminators, the knowledge and information diffusion is considerably low within the social system.

However, Quantity Surveyors represented by the nodes (according to the appendix) of R2, R4, R6, R7, R8, R17, R46, R47 are actors or Quantity Surveyors who have higher reachability compared to other actors positioning them in a favoured position within the social network. Thus, they are interactive and other actors could reach them irrespective of their communicational linkage and reach on to information and knowledge on the AutoCAD software usage. Their influential position could be utilized to upsurge the knowledge dissemination with the social system.

Correspondently, it is evident that a certain number of actors are present with lower reachability compared to the above prominent actors where they are simply using the AutoCAD software but not on a position to share the knowledge on them. Hence this is a clear indication that several Quantity Surveyors are not categorized as the reachable nodes where their position within the network is influential in the innovation dissemination. Notwithstanding to that another portion of the actors are highlighted as the higher reachable nodes indicating that they are dominant players within the social network.

4.6.3 Point connectivity

Point connectivity define the connectivity as the number of nodes required to be removed in order to leave no trail among two nodes to connect them, where the statistical data on point connectivity is essential to identify the connection among actors in a social network.

Referring to Appendix E (III) the point connectivity results of the derived social network, Quantity Surveyors represented by the nodes of R7 and R8 has higher tendency in breakdown of their connections with the information seekers. Thus, with the loss of connections, the information transmission among the Quantity Surveyors will tend to fail. Basically, having a lower value close to zero indicate that there is lack of alternative ways in reaching other nodes among the Quantity Surveyors for the knowledge transmission and exchange of information. Hence, this would ultimately result in the lower tendency towards information exchange. Subsequently, the information interchange from R7 and R8 would be restricted where numerous actors are not allied.

In contradictory to above results as per the Appendix Quantity Surveyors represented by the nodes of R2, R6, R17, R46 and R47 have a relatively higher values for point connectivity which indicate that in means of information and knowledge exchange among Quantity Surveyors in term of AutoCAD Software, these actors are accompanied with numerous paths for information and knowledge diffusion. Accordingly, actors who are searching and are in need of information or knowledge

are stationed at trails which are exposed to take this information and in different pathways to receive information from various trails and communication channels

Consequently, the several ways of attaining each actor designate that the Quantity Surveyors in search of knowledge from R2, R6, R17, R46 and R47 are linked to the information originators in diverse conducts where knowledge diffusion is therefore not subjected to obstructions on the information spread on their pathways of communication flow.

4.6.4 Geodesic Distance

The geodesic distance is utilized to recognise the direct paths among the actors to recognize the connectivity among the nodes. This, the resulted result would aid in the interpretation of the innovation diffusion recognising the traces knowledge and information spread in view of the shortest probable trail among the actors.

Conferring to Appendix E (IV) as the network is reasonably dense the geodesic distances were in the range of 0 to 5, with a moderate speed of information flow through the network .Accordingly, the mean geodesic distance of 2.125 resulting from UCINET analysis states that among each actor two number of links are prevailing on their shortest path in which one node would act as an information contributor

Subsequently it could be identified that if the whole network is entirely linked the information and knowledge distribution among the actors is in a comparatively at a higher rate with the participation of each actor in the flow of information where most reachable and strong influential characters could easily induce into the innovation diffusion.

4.6.5 Degree Centrality

In order to detect the location of the actors in reference to their strength and power on the social network, degree centralization measurement is utilized. Thus, UCINET analysis application for the measure of the centrality of actors was used for the identification all the influential and dominant actors within derived social network on the basis of AutoCAD as he innovation.

The actor's degree measures were resulted from the analysis of the Social Network in relations to Outdegree, Indegree and with reference to overall graph centralization. This, with the identified measure, the most active and dominant actors within the social network could be identified.

Table 4.3: Highest indegree values of the nodes from summarized degree centrality values for the innovation of AutoCAD

Item No	Node	Outdegree	Indegree	nOutdegree	nIndegree
1	R4	3.000	26.000	0.039	0.342
2	R6	3.000	21.000	0.039	0.276
3	R2	3.000	18.000	0.039	0.237
4	R17	3.000	18.000	0.039	0.237
5	R46	3.000	17.000	0.039	0.224
6	R47	3.000	17.000	0.039	0.224

Conferring to the results of the Appendix, the degree centrality value is well identified in each actor with reference to its indegree and outdegree values. Resulting from the Appendix F (I) , the nodes with the highest degree centrality was depicted in the Table 4.2. Concerning to the values in Table 4.2, actor represented by the Node R4, has the highest indegree value which is followed by the actor R6, with a value of 21. Thus, it is revealed that the Quantity Surveyors denoted by these two nodes are dominant contributors in the means of information and knowledge in means of AutoCAD software to the social network. Moreover, this further signify the fact these actors have a projecting position in the social network where they are influential for other Quantity Surveyors in the social structure. It is further convinced that other actors who are in the requirement of the knowledge and information could seek on to these characters in the social structure.

In addition to that actors represented by nodes R2 and R17 with an indegree value of 18, and R46 and R47 with an indegree value of 17, are also apparent to be prominent information contributors to the social structure. Thus, their contribution for the social network is considerable as the information seekers could look forward for them for the information requirement. With their higher connectivity with other information seeking nodes, with a denser network, it aids other actors reach them for knowledge.

Thus, the nodes R4, R6, R2, R17, R46, R47 with their higher number of ties offer more contacts and trails to diffuse their knowledge which upsurges the opportunities to acquire knowledge which would further enhance opportunities to other actors who are not accompanied with direct contacts. In addition to with higher number ties, with the higher degree centrality their position in the social network is stabilized and have more with regard to innovation diffusion.

4.6.6 Closeness Centrality

The closeness centrality facilitates in representing the distances to all the actors in a social network by one distinctive actor in the same network and Figure 4.4 embodies the extracted results from the Appendix F (II).

Closeness Centrality Measures

		1	2	3	4
		inFarness	outFarness	inCloseness	outCloseness
4	R4	143.000	5329.000	53.147	1.426
17	R17	143.000	5326.000	53.147	1.427
6	R6	146.000	5329.000	52.055	1.426
46	R46	165.000	5326.000	46.061	1.427
2	R2	165.000	5325.000	46.061	1.427
47	R47	183.000	5324.000	41.530	1.427
7	R7	212.000	5325.000	35.849	1.427
8	R8	215.000	5325.000	35.349	1.427

Figure 4.2: Retrieved values of closeness centrality measures for the innovation of AutoCAD

It is apparent from Figure 4.2 the in-farness values of R4 and R17 have the minimum value in the sample of respondents of Quantity Surveyors signifying that these actors are the easiest accessible in respect to all the other actors. Moreover all the actors including in the utmost positioning of the actors namely as R4, R17, R6, R46, R2, R47, R7 and R8 are comparatively in the ascending direction of the in farness which explicit the fact that the distances in order to reach the actors in the network to reach them is less, empowering them to be exceptional actors in the social system.

4.6.7 Betweenness centrality

In this study, betweenness centrality is utilized to identify the favoured location of a node or an actor to be positioned on a social network on the geodesic paths amongst

the other pairs on nodes within the network. Accordingly, the betweenness centrality measures were utilized to identify the nature of the nodes in their positioning of the network.

		1	2
		Betweenness	nBetweenness
2	R2	131.429	2.306
17	R17	94.591	1.659
47	R47	91.307	1.602
4	R4	59.798	1.049
6	R6	50.701	0.889
15	R15	47.490	0.833

Figure 4.3: Retrieved values of betweenness centrality measures for the innovation of AutoCAD

In response to the results derived in Figure 4.3, it is apparent that actor represented by the node R2 is at the highest position of the analysis. This corresponds to the fact that this actor is important within the population and is in a favoured position which ultimately results to be an influencer in the network. Similarly, it is evident that nodes R17, R47, R4, R6 and R15 are also located at a favoured position intriguing the effective communication among the actors. Furthermore, the results depict the linkage-among these actors with others in respect to other's location in the social network to develop their connections with most significant and influential Quantity Surveyors within the social structure.

DESCRIPTIVE STATISTICS FOR EACH MEASURE

		1	2
		Betweenness	nBetweenness
1	Mean	11.818	0.207
2	Std Dev	23.220	0.407
3	Sum	910.000	15.965
4	Variance	539.189	0.166
5	SSQ	52272.125	16.089
6	MCSSQ	41517.578	12.779
7	Euc Norm	228.631	4.011
8	Minimum	0.000	0.000
9	Maximum	131.429	2.306
10	N of Obs	77.000	77.000

Network Centralization Index = 2.13%

Figure 4.4: Descriptive Statistics for betweenness of the social network for the innovation of AutoCAD

Referring to the Appendix F (III) on the descriptive statistical data of the betweenness of the nodes in relation to the complete social network, an overall conclusion of the social network could be gained. It is noticeable that a substantial variation is visible among the actors as there is a difference of 131.429 along with mean and the standard deviation.

Correspondently, the overall centrality of the network is significantly low with an index of 2.13% which clearly specify that most of the connections between the actors is likely to be occur without the contribution of the intermediate actors. Thus, it is expressed that within the social network the correlation among the Quantity Surveyors are in a higher state with actors with the higher degree values among the Quantity Surveyors which would facilitate in a speedy innovation diffusion.

4.7 Identification of nature of social network in respective of the CostX usage among Quantity Surveyors

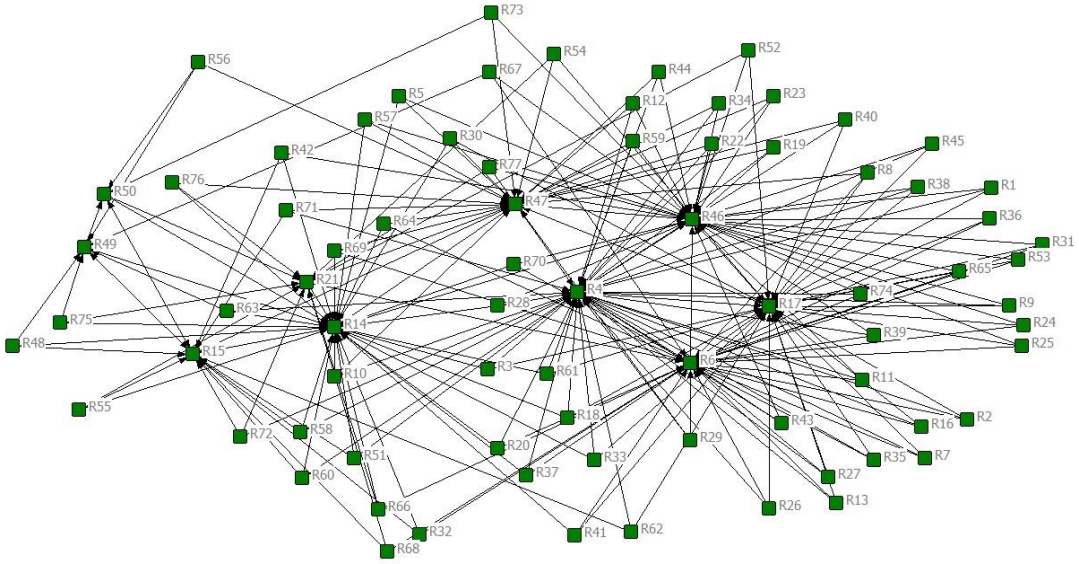

Figure 4.5: Derived Social network among quantity surveyors in respect to the innovation of CostX software

4.7.1 Actor Degree

According to the derived social network on the innovation diffusion of CostX software among the Quantity Surveyors, the results (According to Appendix G (I)) slightly diverges from the derived results on the AutoCAD usage. Noticeably, actors denoted by R4, R46, R6R17, R14, R47 depict higher values of SSQ values of

46,34,32,31,31.25 respectively which indicates that they are the actors dominating the information diffusion among the other nodes in the quantity surveying social system. Thus, it is clear that other information seekers are keen on extracting required knowledge from them as more ties are directed to the above identified actors. Considerably there are identified to be the top most players in this social system considering all the nodes where they have acquired this innovative knowledge and others are reaching them more information. The actors have a greater ability to reach on to individuals as they are highlighted to be acute users of the CostX software.

Yet, UCINET statistics further identified moderate information disseminators indicated as R15 and R21 with their SSQ values of 14 and 10 where they are playing a moderate role in the identified social system in the knowledge transferring of CostX software. However, actors are reaching on to them in a moderate manner where they play an important role in the dissemination of knowledge in this ruled social network. Prominently, the social network derived on innovation diffusion in terms of CostX explicit that only several numbers of actors are prominent, yet others are seeking information from them. This clearly indicate that only several Quantity Surveyors with the required knowledge are available and the software is yet to adopted and diffused among other quantity surveyors within their organizations.

4.7.2 Reachability

Considering the results obtained by the UCINET software (According to Appendix G (II)) reachability among actors considering the CostX software usage is considerably low and higher reachability is only visible among few actors within the network. With the given asymmetric structure, it is visible that only few numbers of actors are only reachable for the other Quantity Surveyors irrespective of their communicational linkages but vice versa is correspondingly restrained.

The outcomes specify a prospect in the network where all the actors are in the same base, where all the information suppliers are not in a situation to be information chasers where the capability to subsidise to the information generation and dissemination is low. Hence, it is resolved that there is a convinced cluster of individuals who is evidently recognised as actors involved in the communication of views and knowledge on CostX software while others are simply in the position of following them.

Analysing further on the Appendix, actors denoted by nodes R4, R6, R14, R15, R17, R21, R46, R47, R49 and R50 are the actors who have higher reachability with all the other actors indicating that these actors are in a preferred position of the network. The outcomes of UCINET analysis specify that only limited actors are reachable within the social network and they are expressively are in a ideal in nature to reach for information by other actors. Besides, they act as knowledge disseminators for all the nodes with the requirement of views and knowledge CostX software and are likely to be identified as most dominant individuals in terms of CostX software innovation diffusion.

As per the results it is apparent that certain portion of QSs are not likely to reach others in their communicational network which highlight that the analysed sample is segmented in to numerous categories where the reachable nodes are encompassed in a category of well conversant and dominant QSs consistent to innovative computer technologies namely CostX whereas the other category are the individual who are in the progression of adhering or not utilising these innovative solutions. Hence, the existence of influential QSs and their accessibility by all the QSs stipulate that there is encouraging environment on the diffusion of innovation through the communicational channels. Consequently, remaining set of QSs who are not accessible to others are most likely to be in an early stage of exposure to the innovation therefore their requirement on straight and substantial grasp to these potential QSs is less.

4.7.3 Point connectivity

The results received form the UCINET analysis on the point connectivity on the Cost innovation explicit moderate diversion in respect to AutoCAD innovation. Rendering to the results as per the Appendix G (III), the actor represented by the nodes R13, R14, R21, R48 and R49 has a lower point connectivity as their analysed values are closed to value of zero thus there is possibility of in losing contacts with the information searchers, where there are higher nodes respective to AutoCAD software. Thus, with the failure of the connections there will be prompt alternate directions for the QSs for the information interchange which will be limited to a certain extend. With that indication, the information exchange from R13, R14, R21, R48 and R49 would be restricted where multiple actors are not connected with them.

However, with the analysed results respondents R4, R6, R17, R46 and R47 are indicating a higher point connectivity compared to other nodes in the network, indicating that they are accompanied with several paths in the information and knowledge exchange in terms of CostX software have established different linkages for the information exchange which make them as key personnel in the innovation diffusion. Thus, they would be accessible by other nodes in terms of communication channel which would bring an optimistic environment for the innovation diffusion. Therefore, actors who are exploring and in the requirement of information or knowledge are positioned at paths where they are present to take this information and in different trails. Subsequently, the numerous paths of reaching each actor label that the Quantity Surveyors in search of knowledge are linked to the information originators R4, R6, R17, R46 and R47 in various manners where information diffusion is thus not lay open to to barriers on their trails of communication flow.

4.7.4 Geodesic Distance

Geodesic distance enables in identifying the positioning of the individuals within the social network, by recognizing their trails of which information is transmitted through the shortest possible trail among the actors. This, it enables to recognize the direct paths in between the nodes to comprehend the connectivity of the actors.

The analysed results through the UCINET software in presented in the Appendix G (IV), and the results presents a varied geodesic distance from 0 to 5 which the indication that knowledge and information on innovation is comparatively spread through the network with a moderate speed. Thus, the pattern is plotted by an adjacency matrix in indicating the number of relations in the shortest trail among them. Additionally, the derived results represent the transmission of information is comparatively not spread with a speed.

Consequently, the mean geodesic distance of 2.171 was derived from UCINET analysis unveil that in between each actor two number of links are existing on their shortest trail where one actor is act as an information benefactor or the influential person on innovation diffusion. Thus, this indicate how distanced is the solid persuasive actor who encouraging on the adoption if innovative of CostX software in the in the field of quantity surveying.

Thus, with the average geodesic value the coherent inference that settled upon the social network that with the assumption of completely linked social network, the information spread among the nodes is in a relatively at a higher rate compared to the AutoCAD innovation where each actor is contributed in the flow of information and the knowledge. In addition to that a strong influence could simply enter in to the information stream where the information seekers will be easily reachable that would aid in a fast movement of information.

4.7.5 Degree Centrality

Centrality measures are required in identifying the most influential and interconnected characters in a social network. Hence, this study utilized centrality measures in identifying the most dominant actors within the social network through the UCINET software analysis for the considered innovation of CostX.

Measures of the actor's degree were followed from the analysis of the Social Network concerning to Outdegree, Indegree values.

Table 4.4: Highest indegree values of the nodes from summarized degree centrality values for the innovation of CostX

	Node	Outdegree	Indegree	nOutdegree	nIndegree
1	R4	3.000	44.000	0.039	0.342
2	R46	3.000	35.000	0.039	0.276
3	R6	3.000	33.000	0.039	0.237
4	R14	3.000	32.000	0.039	0.237
5	R17	3.000	32.000	0.039	0.224
6	R47	3.000	27.000	0.039	0.224

Discussing on the outcomes of the Appendix H (I), the degree centrality values were recognized clearly corresponding to individual actor concerning on its indegree and outdegree values. Consequential from the results of the Appendix, the nodes who have acquired with the highest degree centrality was represented in the Table 4.3. It is vibrant that actor represented by the node R4 has the highest degree centrality, showing that the actor is identified to be the vibrant information disseminator in the network. Hence, it is implied that in terms of the CostX innovation, actor R4 has gained a dominant position in the network, where other nodes could seek the actor for the

require knowledge on CostX innovation. Furthermore, this indicates the fact these actors have a prominent location in the social system where they are significant for other Quantity Surveyors who are seek in formation with regard to computer aided software in Sri Lankan context.

Consequently, actors represented by the node of R46, R6, R14 R17 and R47 are the subsequent actors with the highest degree centrality where they are accompanied with the higher indegree values. Thus, it represents that these actors are highly acceptable as Quantity Surveyors with prominent knowledge on Cost X software where they are bound as significant information distributors among the social system in Sri Lanka. With their complex connectivity with other information searching actors, with a tied network, it supports other individuals to grasp them for knowledge.

In addition to that nodes R46, R6, R14 R17 and R47 with higher degree centrality values, present more nodes and traces to disseminate their information which increases the prospects for other Quantity Surveyors to acquire knowledge which increase prospects to other Quantity Surveyors without any direct contacts.

4.7.6 Closeness Centrality

The measure of closeness centrality is utilized in identifying the distances to all the nodes in a social network by one individual actor in the same network. The Figure 4.6 presents the actors with the lower closeness centrality measures, which is extracted from the Appendix H (II).

Closeness Centrality Measures

		1	2	3	4
		inFarness	outFarness	inCloseness	outCloseness
4	R4	115.000	5183.000	66.087	1.466
46	R46	119.000	5178.000	63.866	1.468
47	R47	127.000	5175.000	59.843	1.469
17	R17	129.000	5178.000	58.915	1.468
6	R6	130.000	5183.000	58.462	1.466
14	R14	144.000	5176.000	52.778	1.468
15	R15	173.000	5177.000	43.931	1.468

Figure 4.6: Retrieved values of closeness centrality measures for the innovation of CostX

It is comprehended from Figure 4.6 that actor presented by the node R4 has the minimum in farness value in the derived social network of Quantity Surveyors presenting that these actors are the most straightforwardly reachable I, actors in terms of the requirement of the knowledge on CostX innovation. Similarly, the subsequent actors namely as R4, R46, R47, R17, R6, R14 and R15 are relatively in the mounting in their infarness values depicting their closer distances in order to reach the actors in the social system where they are the identified significant characters in the dissimulation knowledge corresponding to CostX software. Hence, these actors are the most positioned characters in the social system for the other information seekers to reach in the requirement of the information and knowledge on the CostX software

4.7.7 Betweenness centrality

Betweenness centrality is applied to recognize the ideal location of an actor to be placed on a social network on the geodesic paths amongst the other pairs on nodes within the network. Consequently, the betweenness centrality measures were utilized to identify the nature of the nodes in their positioning of the network.

		1	2
		Betweenness	nBetweenness
47	R47	221.200	3.881
15	R15	128.450	2.254
14	R14	118.600	2.081
17	R17	100.533	1.764
46	R46	96.567	1.694
50	R50	71.567	1.256
4	R4	53.150	0.932
49	R49	43.867	0.770
6	R6	30.583	0.537

Figure 4.7: Retrieved values of betweenness centrality measures for the innovation of CostX

Corresponding to the results derived in Figure 4.7, it is clear that actor represented by the node R47 is at the highest position of the analysis of betweenness centrality. This resembles to the fact that this actor is significant within the population and is in a favoured position which eventually results to be an influencer in the social network. Correspondingly, it is evident that nodes R14, R14,R17, R46,R50, R4, R49 and R6 are similarly positioned at a favoured position captivating the effective communication

among the nodes of the social network. Additionally, the outcomes portray the linkage-among these actors with others in respect to other's position in the social network to progress their networks with most substantial and persuasive Quantity Surveyors within the social structure.

DESCRIPTIVE STATISTICS FOR EACH MEASURE

		1 Betweenness	2 nBetweenness
1	Mean	11.558	0.203
2	Std Dev	36.055	0.633
3	Sum	890.000	15.614
4	Variance	1299.943	0.400
5	SSQ	110382.609	33.974
6	MCSSQ	100095.594	30.808
7	Euc Norm	332.239	5.829
8	Minimum	0.000	0.000
9	Maximum	221.200	3.881
10	N of Obs	77.000	77.000

Network Centralization Index = 3.73%

Figure 4.8: Descriptive Statistics for betweenness of the social network for the innovation of CostX

Conferring to the Appendix J (III) on the descriptive statistical data of the betweenness of the nodes in relation to the complete social network, an overall conclusion of the social network could be obtained. It is visible that a considerable disparity is noticeable among the actors as there is a difference of 221.2 along with mean and the standard deviation.

Correspondently, the total centrality of the network is moderately high with an index of 3.73% which clearly stipulate that most of the contacts among the actors is possible to be happen deprived of the influence of the intermediate actors. Thus, it is articulated that within the social network the relationship among the Quantity Surveyors are in a developed state with actors with the higher degree values among the Quantity Surveyors which would enable in a prompt innovation diffusion.

4.8 Identification of nature of social network in respective of the Measurement Rules among Quantity Surveyors

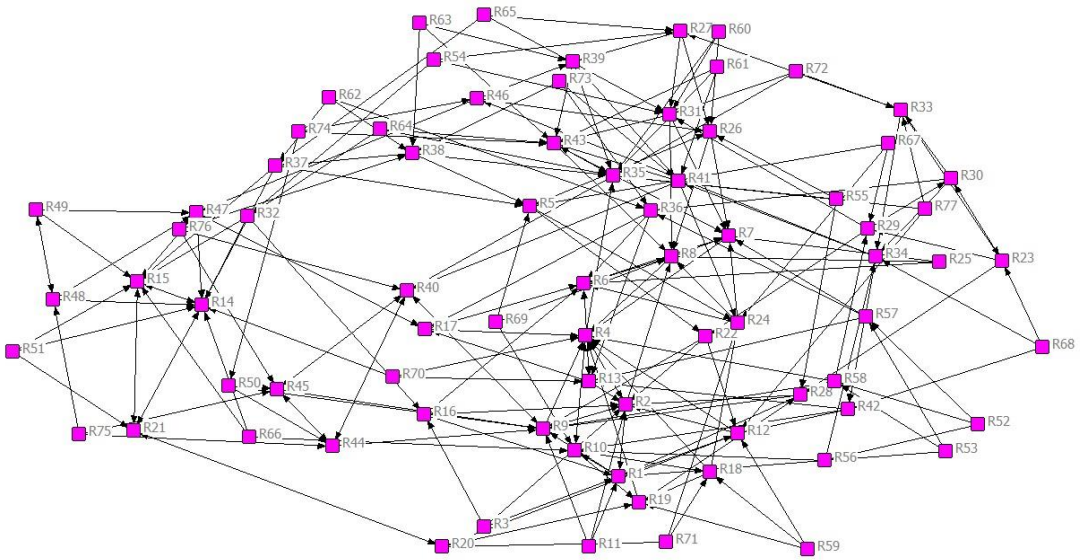

Figure 4.9: Derived Social network among quantity surveyors in respect to the innovation of New Rules of Measurement

4.8.1 Actor Degree

In respective of the derived Social Network through the UCINET software in means of the information seeking on Measurement rules (in terms of New measurement Rules), indicate a different nature in respect to the other derived social networks in terms of computer aided software used by Quantity Surveyors (Appendix I (I)). The derived SSQ values on different nodes range from 11 to 8 in 14% of the nodes and among 61% of the other actors are accompanied with SSQ value of 7 to 2. Thus, 75% of the actors of the network are involved as the information disseminators which is unnoticeable with respective other innovations considered through the study. This clearly depicts that quantity Surveyors are much more comfortable with information sharing and seeking as the others are compatible with knowledge and the practice of it. Thus, it is clearly evident that in terms of measurement rules the knowledge surpassed with the quantity Surveyors are much disseminated and entangled among the fellow Quantity Surveyors where it has resulted in the development of a tied network among themselves.

4.8.2 Reachability

Referring to the results analysed through the UCINET analysis tools the reachability of actors to others diverts with respect to AutoCAD software information diffusion and CostX software information diffusion. The reachability of the actors as per the attached Appendix I (II) clearly signify higher reachability among considerable number of actors are accessible through another actor for information seeking and disseminating irrespective of the actors in-between the communicational linkages of one another. Considerably all the actors are in a situation to contribute to the information transmission along with knowledge transfers as they are more reachable among other nodes irrespective of their communicational linkages. Their ability for the effective innovation diffusion is higher as they are keen on the subject and as it is easily accessible and understandable to them unlike software usage. Hence it is obvious that unlike other two considered innovation, considerable number of Quantity Surveyors are engaging in the dissemination of information and knowledge rather than seeking of knowledge.

Moreover, further with the analysis in the Appendix actors symbolized by nodes of R1,R2,R4,R6,R7,R8,R9,R10,R12,R13,R14,R15,R17,R18,R19,R20,R21,R24,R28,R35,R39,R40,R41,R43,R44,R45,R47 are the Quantity Surveyors who have higher reachability with respect to other nodes demonstrating that these actors are in a preferred position in innovation diffusion. Thus, expressed results indicated these actors are reachable within the Quantity Surveying community and in a foremost position as the information disseminators mainly as resource personnel in the network.

4.8.3 Point connectivity

In the terms of point connectivity in means of New Rules of Measurement, derived UCINET result according to Appendix I (III) explicit controversial results in terms of the analysis carried out with reference to software innovations. Conferring to the results on the derived network, 13% of the node are in the possible state of losing contacts with the information seekers. It is a shown among the nodes of R12, R13, R18, R28, R35, R39, R41, R43, R44 and R45 that being their point connectivity value is low and close to value of zero, with the loss of connections among nodes, no

alternative routes might be available among the Quantity Surveyors to reach others for knowledge and information.

However, it is vividly noticeable a considerable number of nodes are having higher point connectivity and they were identified as R1, R2, R3, R6, R7, R8, R9, R10, R14,R15, R16, R21, R24, R40 and R47 . Thus, it is apparent that 18% of the actors within the social network are reachable to various trails of information and knowledge exchange. Relating to the point connectivity with other considered innovation, this explicit a higher point connectivity thus indicating that the nodes are active in information exchange and they have higher reachability with other nodes in different pathways rather than the drawn links. Hence this is much advantageous in respective to information seeking Quantity Surveyors as the actors connected with R1, R2, R3, R6, R7, R8, R9, R10, R14,R15, R16, R21, R24, R40 and R47 are related to the information originators in diverse ways where knowledge diffusion is consequently not disturbed by any obstructions on their trails of communication flow.

4.8.1 Geodesic Distance.

In the derived network from using UCINET software, in respect to the Appendix I (IV) as the network is moderately condensed, the geodesic distances are moderately wide-ranging from 0 to 6 where the information on the innovation commonly caries out in a modest speediness in the social network. The outcome indicates that between two actors, 0 to 6 number of links are prevailing amongst the shortest path amid them.

Thus, the mean geodesic distance of 3.367 resultant from UCINET direct the fact on that in between each actor three number of links are existing on their shortest path where one actor act as an information provider who persuading on the acceptance innovative application in the field of quantity surveying.

Successively with the assistance of the average geodesic value the coherent conclusion that settled upon the social network is if the whole network is entirely connected the information spread among the actors is in a fairly at a developed rate.

4.8.2 Degree Centrality

With respect to innovation with regards to New Measurement rules, finding the most influential characters within the social network, the degree centrality was applied. Hence, UCINET software analysis presented the degree centrality measures indicating the most influential actors or the nodes in the social system derived based upon the New Rules of Measurement innovation.

Specifically, in this regard, Outdegree, Indegree corresponding to overall graph centralization will be utilized to detect the most influential personnel in the Social Network.

Table 4.5: Highest indegree values of the nodes from Summarized degree centrality values for the innovation of New Rules of Measurement

Item No	Node	Outdegree	Indegree	nOutdegree	nIndegree
1	R4	3.000	12.000	0.039	0.342
2	R9	3.000	11.000	0.039	0.276
3	R35	3.000	11.000	0.039	0.237
4	R2	3.000	11.000	0.039	0.237
5	R43	3.000	10.000	0.039	0.224
6	R8	3.000	10.000	0.039	0.224

Rendering to the results of the Appendix J (I), the degree centrality value is clearly specified in respective node concerning its indegree and outdegree values. Follow-on from the Appendix, the actors with the highest degree centrality was presented in the Table 4.4. Relating to the values presented in Table 4.4, actors are accompanied with lower outdegree values, but overall actors are spread out in proportionately where are collaterally engage in the information diffusion. It is well connected and everyone is playing a major role in the information diffusion thus, enabling them to be strong characters within the social system.

However, the node R4, having the highest indegree value is an influential individual accompanied by the succeeding nodes of R9, R35, R2, of 11 indegree value and R43 and R8 of having 10 as an indegree value. Subsequently, it is obvious that the network is accompanied with active members where knowledgeable and influential people are in abundance. It aids in developing a knowledgeable social system in respect where

any individual could seek on to attain information and knowledge from many Quantity Surveyors. With the complex connectivity among the information seeking nodes and information disseminators, with a denser network, it facilitates other actors to reach them for knowledge and information.

Correspondently, 4 number of nodes represent 9 as indegree values while 5 number of nodes represent 8 as indegree values and 7 nodes represent 7 as indegree value, where all the actors acted as information benefactors to the social system in means of New rules of measurement, which is unique to this derived social network compared with the other networks in respective to computer aided software. .

4.8.3 Closeness Centrality

The closeness centrality enables in demonstrating the distances to all the nodes in a network by one individual actor in the identical network and Figure 4.10 represents the obtained outcomes from the Appendix

Closeness Centrality Measures

		1	2	3	4
		inFarness	outFarness	inCloseness	outCloseness
4	R4	180.000	3927.000	42.222	1.935
8	R8	193.000	3934.000	39.378	1.932
2	R2	196.000	3936.000	38.776	1.931
35	R35	204.000	3950.000	37.255	1.924
7	R7	205.000	3935.000	37.073	1.931
6	R6	208.000	3944.000	36.538	1.927

Figure 4.10: Retrieved values of closeness centrality measures for the innovation of New Rules of Measurement

From Figure 4.10, it is seeming that the in-farness values of R4 is the minimum in the derived statistical analysis (Appendix J (II)) from the UCINET software. Thus, it implies R4 is an easily accessible actor for others in respect to all the other actors in respect to new Rules of Measurement. Similarly, actors represented by the nodes of R8 and R2 are also in presenting comparatively low values on in farness where they are the next accessible Quantity Surveyors in the search of information and knowledge. Thus, compared to other computer aided innovations, this seems to be more apparent within the actors of the social network. Correspondingly, entire network's nodes are

at a dense position to reach information where it is further induced by the actors R35, R7 and R6 as the distances to reach these actors in the social network is relatively less than others.

4.8.4 Betweenness centrality

The betweenness centrality measures were applied to recognize the behaviour of the nodes in their location of the social network.

		1	2
		Betweenness	nBetweenness
4	R4	586.447	10.289
10	R10	383.674	6.731
35	R35	306.026	5.369
19	R19	244.182	4.284
17	R17	231.342	4.059
9	R9	204.509	3.588

Figure 4.11: Retrieved values of betweenness centrality measures for the innovation of New Rules of Measurement

Considering the results shown in Figure 4.11, it is clear that actor represented by the node R4 has taken the first place in betweenness value which implies that node plays a significant role in the population and located at a position which is positive to the whole network. This resembles that this actor is imperative within the other actors and is in a preferred location which eventually identify to be an influencer in the social network. Equally, nodes R10, R35, R19, R17 and R9 are also situated at an ideal location captivating an active transmission of knowledge and information among the actors. Besides, the outcomes illustrate the connections-among these nodes with one another's corresponding to one's location in the social network to grow their interconnections with most substantial and powerful Quantity Surveyors inside the social network.

DESCRIPTIVE STATISTICS FOR EACH MEASURE

		1 Betweenness	2 nBetweenness
1	Mean	70.286	1.233
2	Std Dev	99.780	1.751
3	Sum	5412.000	94.947
4	Variance	9956.055	3.064
5	SSQ	1147002.500	353.032
6	MCSSQ	766616.250	235.955
7	Euc Norm	1070.982	18.789
8	Minimum	0.000	0.000
9	Maximum	586.447	10.289
10	N of Obs	77.000	77.000

Network Centralization Index = 9.17%

Figure 4.12: Descriptive Statistics for betweenness of the social network for the innovation of New Rules of Measurement

With reference to the Appendix J (III) on the descriptive statistical data, a a considerable variation is noticeable amongst the actors as there is a difference of 586.447, further with the mean and the standard deviation.In addition to that, the general centrality of the network is expressively higher compared with the other derived networks with an index of 9.17% which evidently lay down that most of the contacts amongst the actors is expected to be arise deprived of the involvement of the middle actors. Therefore, it is articulated that in a social network the relationship between the Quantity Surveyors are in an advanced state with actors of higher degree values which enable in a prompt innovation diffusion.

4.9 Comparison of the derived social networks in respect to respective innovations in the field of Quantity Surveying

4.9.1 Measures on Cohesion

Measures on cohesion	Innovation I	Innovation II	Innovation III
Actor Degree	• R4 and R6 are prominent in contributing information to the social system, • R46 and R47 with SSQ of 17, R14, R15, R35, R37, R43 with SSQ value of 7 and R56, R57, R58 with SSQ value of 6 were also led as information disseminators	• R4, R46, R6R17, R14, R47 depict higher values of SSQ values of 46,34,32,31,31.25 • R15 and R21 with their SSQ values of 14 and 10 where they are playing a moderate role in knowledge transferring of CostX	• The derived SSQ values on different nodes range from 11 to 8 in 14% of the nodes • among 61% of the other actors are accompanied with SSQ value of 7 to 2. • 75% of the actors of the network are involved as the information disseminators which is unnoticeable with respective other innovations considered through the study. • the knowledge surpassed with the quantity Surveyors are much disseminated and entangled among the fellow Quantity Surveyors where it has resulted in the development of a tied network among themselves.
Reachability	• R2, R4, R6, R7, R8, R17, R46, R47 are actors with higher reachability compared to other actors the social network.	• R4, R6, R14, R15, R17, R21, R46, R47, R49 and R50 are the actors with higher reachability compared to other actors indicating that these	• Actors symbolized by nodes of R1,R2,R4,R6,R7,R8,R9,R10,R12,R13,R14,R15,R17,R18,R19,R20,R21,R24,R28,R35,R39,R40,R41,R43,R

		actors are in a preferred position of the network.	44,R45,R47 are the Quantity Surveyors who have higher reachability demonstrating that these actors are in a preferred position in innovation diffusion. • Unlike other computer aided innovations, the actors are much reachable with one another in connection with new measurement rules.
Point Connectivity	• R7 and R8 has higher tendency in breakdown of their connections with the information seekers. • R2, R6, R17, R46 and R47 have a relatively higher values for point connectivity which indicate that in means of information and knowledge exchange among Quantity Surveyors in term of AutoCAD Software, • R2, R6, R17, R46 and R47 actors are accompanied with numerous paths for information and knowledge diffusion.	• R13, R14, R21, R48 and R49 has a lower point connectivity as their analysed values are closed to value of zero thus there is possibility of in losing contacts with the information searchers, • R4, R6, R17, R46 and R47 are indicating a higher point connectivity compared to other nodes in the network, indicating that they are accompanied with several paths in the information and knowledge exchange in terms of CostX software R4, R6, R17, R46 and R47 have established different linkages for the information exchange which make them as key personnel in the innovation diffusion.	• 13% of the node are in the possiblity oflosing contacts with the information seekers. • The nodes of R12, R13, R18, R28, R35, R39, R41, R43, R44 and R45 that being their point connectivity value is low and close to value of zero, with the loss of connections among nodes, no alternative routes might be available among the Quantity Surveyors to reach others for knowledge and information. • higher point connectivity were among R1, R2, R3, R6, R7, R8, R9, R10, R14,R15, R16, R21, R24, R40 and R47 . • 18% of the actors within the social network are reachable to various trails

			of information and knowledge exchange. • the information originators in diverse ways where knowledge diffusion is consequently not disturbed by any obstructions on their trails of communication flow.
Geodesic Distance	• The network is reasonably dense and the geodesic distances were in the range of 0 to 5, with a moderate speed of information flow through the network. • The mean geodesic distance of 2.125	• Accompanied with varied geodesic distance from 0 to 5 and knowledge and information on innovation is comparatively spread through the network with a moderate speed. • Derived results represent the transmission of information is comparatively not spread with a speed. • The mean geodesic distance of 2.171	• The geodesic distances are moderately wide-ranging from 0 to 6 where the information on the innovation commonly caries out in a modest speediness in the social network. • The mean geodesic distance of 3.367

4.9.2 Measures of Centrality

Measures on centrality	Innovation I	Innovation II	Innovation III
Degree Centrality	• Node R4, has the highest indegree value which is followed by the actor R6, with a value of 21. • nodes R2 and R17 with an indegree value of 18, and R46 and R47 with an indegree value of 17, are also apparent to be prominent information contributors to the social structure. • the nodes R4, R6, R2, R17, R46, R47 with their higher number of ties offer more contacts and trails to diffuse their knowledge which upsurges the opportunities to acquire knowledge which would further enhance opportunities to other actors who are not accompanied with direct contacts.	• Node R4 has the highest degree centrality, showing that the actor is identified to be the vibrant information disseminator in the network. • Actors represented by the node of R46, R6, R14 R17 and R47 are the subsequent actors with the highest degree centrality where they are accompanied with the higher indegree values.	• R4, having the highest indegree value is an influential individual accompanied by the succeeding nodes R9, R35, R2, of 11 indegree value and R43 and R8 of having 10 as an indegree value. • 4 number of nodes represent 9 as indegree values while 5 number of nodes represent 8 as indegree values and 7 nodes represent 7 as indegree value, where all the actors acted as information benefactors to the social system • New rules of measurement, which is unique to this derived social network compared with the other networks in respective to computer aided software. .
Closeness Centrality	• R4 and R17 have the minimum value signifying that these actors are the easiest accessible in respect to all the other actors. • R6, R46, R2, R47, R7 and R8 are comparatively in the ascending direction of the in farness which explicit the fact that the distances in	• R4 has the minimum in farness value. The subsequent actors namely as R4, R46, R47, R17, R6, R14 and R15 are relatively in the mounting in their infarness values depicting their closer distances in order to reach the actors in the social system where they are the identified significant characters in the	• R4 is the minimum in the derived statistical analysis which implies R4 is an easily accessible actor for • Actors represented by the nodes of R8 and R2 are also in presenting comparatively low values on in farness where they are the next accessible

	order to reach the actors in the network to reach them is less, empowering them to be exceptional actors in the social system.	dissimulation knowledge corresponding to CostX software.	• R35, R7 and R6 as the distances to reach these actors in the social network is relatively less than others.
Betweenness centrality	• R17, R47, R4, R6 and R15 are located at a favoured position intriguing the effective communication among the actors. • a substantial variation is visible among the actors as there is a difference of 131.429 along with mean and the standard deviation. • overall centrality of the network is significantly low with an index of 2.13% which clearly specify that most of the connections between the actors is likely to be occur without the contribution of the intermediate actors.	• actor represented by the node R47 is at the highest position of the analysis of betweenness centrality. • Nodes R14, R14,R17, R46,R50, R4, R49 and R6 are similarly positioned at a favoured position captivating the effective communication among the nodes of the social network. • A considerable disparity is noticeable among the actors as there is a difference of 221.2 along with mean and the standard deviation. • the total centrality of the network is moderately high with an index of 3.73% which clearly stipulate that most of the contacts among the actors is possible to be happen deprived of the influence of the intermediate actors.	• R4 has taken the first place in betweenness value which implies that node plays a significant role in the population and located at a position which is positive to the whole network. • Nodes R10, R35, R19, R17 and R9 are also situated at an ideal location captivating an active transmission of knowledge and information among the actors • 9.17% which evidently lay down that most of the contacts amongst the actors is expected to be arise deprived of the involvement of the middle actors.

4.10 Opinion Leaders in respective to derived Social Networks of respective innovations in the field of Quantity Surveying

The derived social networks and their measures through centrality were utilized to locate the opinion leaders among the three different social networks. Thus, measures of degree centrality, closeness centrality and betweenness centrality highlights an actor's significance within a social network. Nevertheless, the use of measure of degree centrality allows in the direct identification of the opinion leaders as specified in the Chapter 03 since they are escorted with the higher connection and social accessibility than others in the social network.

4.10.1 Identification of Opinion Leaders in respective of the AutoCAD software among Quantity Surveyors

The resultant network through the UCINET software and the highlighted opinion leaders are demonstrated in colour red in represented in the Figure 4.13 and the Appendix.

The positioning of the actors clearly demonstrates how every node are interconnected corresponding to the information and knowledge seeking in the requirement of the AutoCAD software.

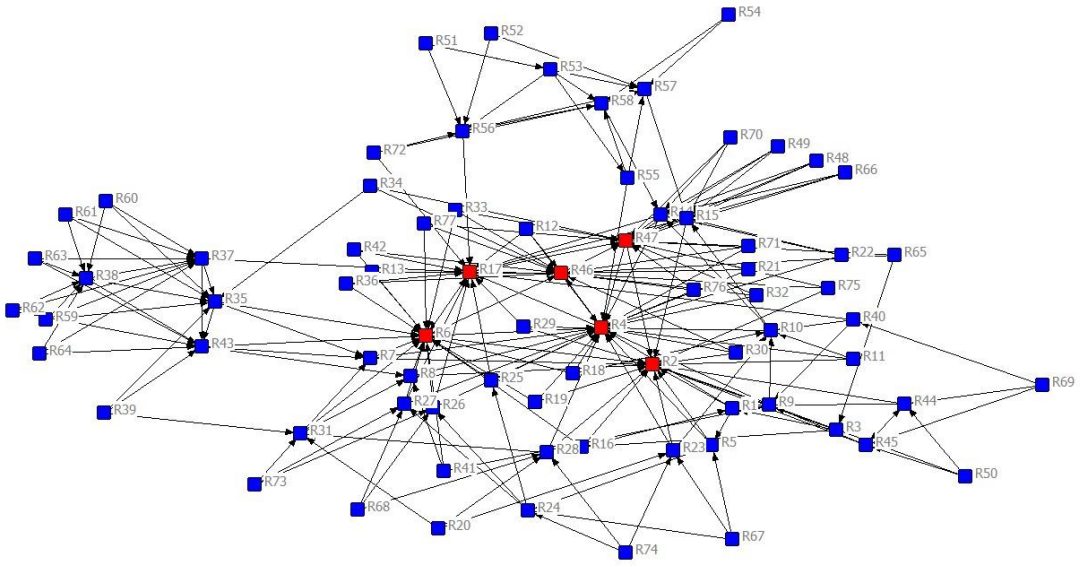

Figure 4.13: Identified opinion leaders in the derived social network for the innovation of AutoCAD

Concerning on the Figure 4.13 and the attached Appendix the nodes of R4, R6, R47, R2, R17 and R46 are identified to be the actors with the highest degree centrality with reference to the degree centrality as per Social Network Analysis. The Table 4.5 displays the concise statistical data measures of the actors signified by the social network who were identified to be Opinion Leasers in the measures of degree centrality.

Table 4.6: Summarized centrality measures of the identified opinion leaders for the innovation of AutoCAD

Item No	Node	Degree	Betweenness	Closeness (in closeness)
1	R4	28.000	59.798	53.147
2	R6	21.000	50.701	52.055
3	R47	19.000	91.307	62.712
4	R2	19.000	131.429	46.062
5	R17	18.000	94.591	53.147
6	R46	18.000	31.736	46.041

Table 4.5 represent the statistical values on centrality measures with reference to the identified opinion leaders in means of degree centrality. Thus, it is visible that actor represented by R4 has the highest degree centrality with a value of 28. Hence R4 act as n opinion leader with the highest degree centrality value being a vibrant information disseminator in relevance to the AutoCAD software. Correspondently, R6 with the succeeding highest degree centrality value, and R47, R2, R17 and R46 has become the next corresponding opinion leaders with the next set of highest values of degree centrality. Accordingly, these actors are identified by the social system itself who act as the powerful, knowledgeable Quantity Surveyors with the required knowledge who could be reachable in the requirement of knowlsdege or information in the means of AutoCAD software.

Nevertheless, considering the measure of closeness and betweenness, the recognised opinion leaders in terms of degree centrality are in the utmost position of the centrality measure but not in corresponds to the exact order of degree centrality. Referring to the measure of betweenness, it is well visible that order of nodes in terms of degree centrality is not applicable. This, considerable variations could be identified in terms of betweenness where node R2 represents the highest betweenness values whereas R46 represents the lowest. Consequently, R2 has the highest control over the social

network, where more information pass through the actor. Thus, actors with higher betweenness R17 and R47 are dominant in information exchange through them. Although R4 with the highest degree of centrality, although having a low betweenness value where the actor plays an important role in social network formation and stratification.

Conferring to the closeness measures, it is visible that it does not tally with the order of degree centrality but the actors have a considerable variation of their order of closeness when compared with degree centrality. Thus, highest value for closeness is visible with the actor R47 and the lowest with the actor R6. Hence, overall conclusion is that opinion leaders are dispersed within the social network without being centralized. Thus, the clear indication of Opinion Leaders could be gained thought the measures of degree centrality with the socio-metric method.

4.10.2 Identification of Opinion Leaders in respective of the Measurement Rules among Quantity Surveyors

According to the Figure 4.14 and the attached Appendix, the identified opinion leaders through the centrality measures were depicted and highlighted. Their interconnectivity is visible within the derived social network and how the actors are dispersed it visible with their representation with the UCINET analysis. The opinion leaders are identified by the measure of centrality by considering the degree centrality as the main measure for the identification.

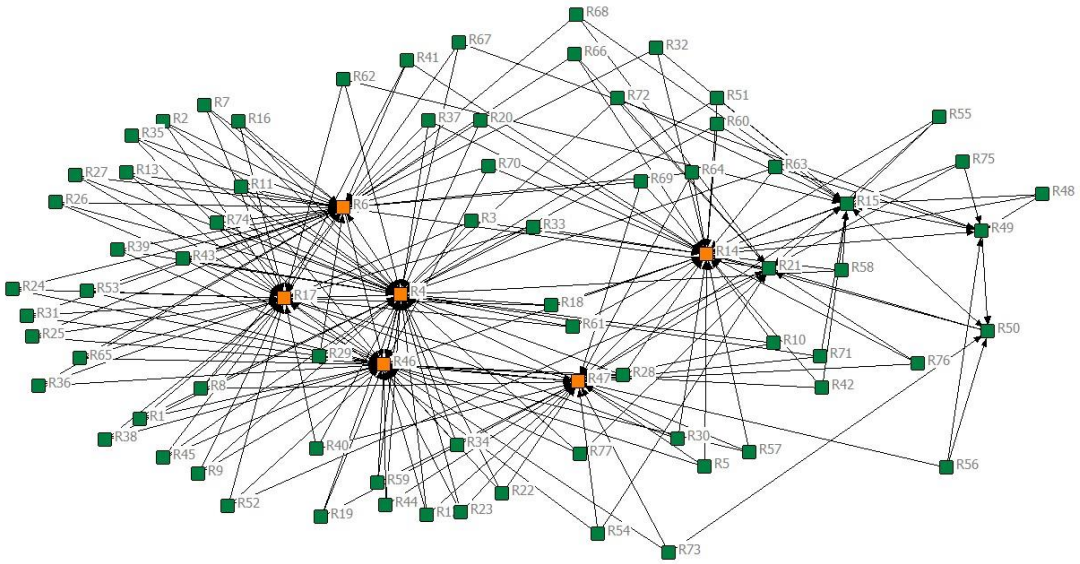

Figure 4.14: Identified opinion leaders in the derived social network for the innovation of CostX

Discussing on Figure 4.14 and the attached Appendix the actors represented by the nodes of R4, R46, R6, R14, R17, R47 were identified to be the opinion leaders where their higher degree centrality values than the rest of the actors. The Table 4 presents the summarized centrality measures of the identified opinion leaders through the degree centrality measures.

Table 4.7: Summarized centrality measures of the identified opinion leaders for the innovation of CostX

Item No	Node	Degree	Betweenness	Closeness (in closeness)
1	R4	44.000	53.150	66.087
2	R46	35.000	96.567	63.866
3	R6	33.000	30.583	58.462
4	R14	32.000	118.600	52.778
5	R17	32.000	100.533	58.915
6	R47	27.000	221.200	59.843

According to Table 4.6 the above identified actors' centrality measures indicate controversial facts with regard to each degree centrality measures. Concerning on the degree centrality, actor R4 has the highest value with 44 ties, which is quite a high considerable value in respect to all the other actors. Thus, R4 has become a powerful and strong actor in the derived information network as most of the other Quantity Surveyors are directed to gain knowledge and information of CostX software from the actor. Following R4, actors represented by the nodes of R46, R6, R14 and R17 has the next higher degree values of centrality where they are in the highly active within the

social network in means of being higher information disseminators in terms of CostX software. In conclusion, considering the degree centrality value only, the above actors area highlighted to be the highest influential characters in the society in terms of knowledge and information transmission of CostX.

Considering the measures of betweenness centrality, the values show massive variation of the values compared to degree centrality. The highest value of betweenness is visible in the actor R47 where it depicts a higher variation with the actor R4 who has the highest degree centrality value. Thus, it is apparent that the node R47 has the highest control over the social network, where more information pass through the actor than R4 who has the highest number of nodes. Considerably, it is vibrant that R4 although having highest number of ties its being is a weal character in the information dissemination to the whole network compared to other significant information distributors.

Deliberating on the closeness measures, it is noticeable that it does not completely in the order of degree centrality but the actors have a slight variation of their order of closeness when compared with degree centrality. Thus, highest value for closeness is visible with the actor R4 and the lowest with the actor R14. Unlike in the social network developed with the information network of AutoCAD software, the actor with the highest degree centrality has the highest value for closeness. Henceforth, overall conclusion is that opinion leaders are spread within the social network without being centralized. Thus, the strong sign of Opinion Leaders could be grown thought the measures of degree centrality with the socio-metric method.

4.10.3 Identification of Opinion Leaders in respective of the Measurement Rules among Quantity Surveyors

The subsequent social network through the UCINET software and the emphasised opinion leaders are verified in a highlighted colour is represented in the Figure 4.15 and the Appendix. The locating of the actors clearly establishes how every node are interconnected conforming to the information and knowledge quest for the requirement of the knowledge of New measurement Rules.

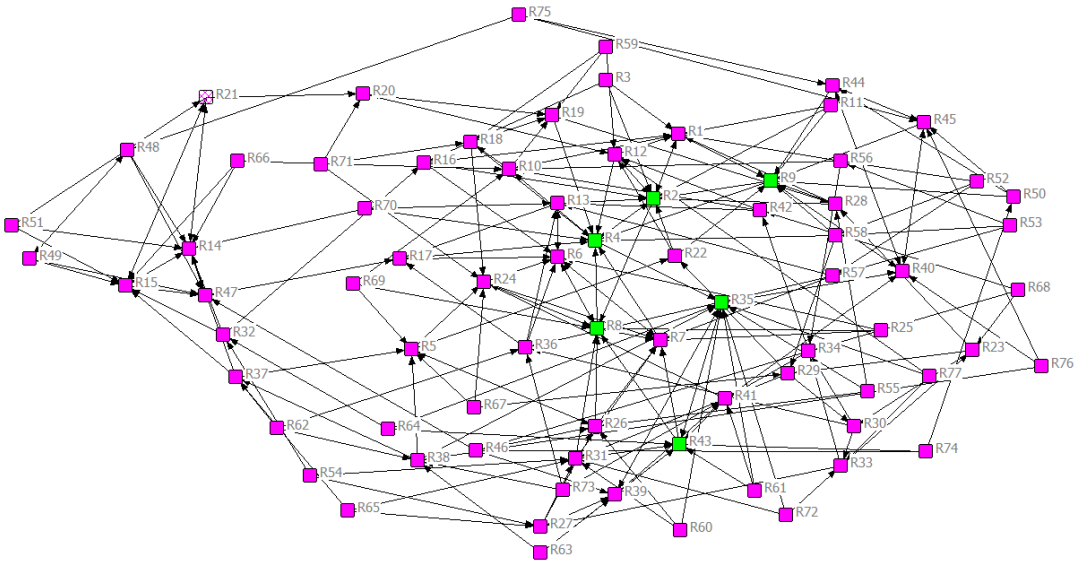

Figure 4.15: Identified opinion leaders in the derived social network for the innovation of New Rules of Measurement

Stating to the Figure 4.15 and the attached Appendix the nodes of R4, R9, R35, R2, R43 and R8 are recognized as the opinion leaders who are verified through the statistical centrality measures of degree, betweenness, and closeness. Nevertheless, the opinion leaders are identified by the measure of centrality by considering the degree centrality as the main measure for the identification according to the given justification in chapter 03.

Table 4.8: Summarized centrality measures of the identified opinion leaders for the innovation of New Rules of Measurement

Item No	Node	Degree	Betweenness	Closeness (in closeness)
1	R4	12.000	586.447	42.222
2	R9	11.000	204.509	33.188
3	R35	11.000	306.026	37.255
4	R2	11.000	177.450	38.776
5	R43	10.000	96.544	30.769
6	R8	10.000	197.562	39.378

The summarized statistical values on Table 4.7 signify on the centrality measures of degree centrality R4, R9, R35, R2, R43 and R8 are the actors with the nodes with higher degree centrality in the derived social network of Quantity Surveyors and then identified as the opinion leaders corresponding to this network.

The degree centrality values of the identified Opinion leaders are low compared to the other networks and are closely connected with each node and their active participation in the information and knowledge transmission is very high. It is visible that although Node R4 has the highest degree centrality value the subsequent actors also are accompanied in the same range of value from 12 to 10 with a lower variation. Thus, it is obvious that these identified actors are equally strong and influential characters in the information transmission. Hence in overall conclusion, it is evident that the network is much connected and information seeking is easily conducted through the network unlike the other innovations.

In view of the measures of betweenness centrality, the values show a slight variation of the values compared to degree centrality. The highest value of betweenness is visible in the actor R4 who has the highest degree centrality value. Thus, it is apparent that the node R4 has the uppermost control over the social network, where more information pass through the actor. Considerably, there is a match between the value of the degree centrality and betweenness but it is not visible with the R43 and R8. Although R43 has a higher degree centrality, there is a considerable diminished value of its betweenness measure indicating that actor has a lower control over information exchange.

Reflecting on the closeness measures, it is noticeable that it does not completely in the order of degree centrality but the actors have a slight variation of their order of closeness when compared with degree centrality. Thus, highest value for closeness is visible with the actor R4 and the lowest with the actor R43. Unlike in the social network developed with the information network of computer related software, the actor with the highest degree centrality has the highest value for closeness. Henceforth, overall conclusion is that opinion leaders are spread within the social network without being centralized. Thus, the strong sign of Opinion Leaders could be grown thought the measures of degree centrality with the socio-metric method.

4.11 Comparison of the identified opinion leaders in respect to respective innovations in the field of Quantity Surveying

The identified Opinion Leaders in respect of each innovation, is summarized as follows in the Table 4.8. Thus, it is visible that a considerable connection is visible with the software related innovations but have a considerable variation with the innovation related to core area of Quantity Surveying which is New Rules of Measurement.

Table 4.9: Summarized measures of Opinion Leaders in respective to each Innovation

	Item No	Node	Degree	Betweenness	Closeness (in closeness)
Innovation 01 AutoCAD software	1	R4	28.000	59.798	53.147
	2	R6	21.000	50.701	52.055
	3	R47	19.000	91.307	62.712
	4	R2	19.000	131.429	46.062
	5	R17	18.000	94.591	53.147
	6	R46	18.000	31.736	46.041
	Item No	Node	Degree	Betweenness	Closeness (in closeness)
Innovation 02 CostX software	1	R4	44.000	53.150	66.087
	2	R46	35.000	96.567	63.866
	3	R6	33.000	30.583	58.462
	4	R14	32.000	118.600	52.778
	5	R17	32.000	100.533	58.915
	6	R47	27.000	221.200	59.843
	Item No	Node	Degree	Betweenness	Closeness (in closeness)
Innovation 03 New rules of Measurement	1	R4	12.000	586.447	42.222
	2	R9	11.000	204.509	33.188
	3	R35	11.000	306.026	37.255
	4	R2	11.000	177.450	38.776
	5	R43	10.000	96.544	30.769
	6	R8	10.000	197.562	39.378

Thus, it is visible that all the identified opinion leaders in related to computer software are almost equal except for few actors. In addition to that these actors represents higher degree of centrality in respect to the innovation of NRM. Hence it clearly visible that same set of actors are highlighted as the Opinion leaders in respect for two innovations where they are identified by the information disseminators as each social network. Hence, their contribution could be taken and utilize by each governing body in the dissemination of the innovations. However, it is apparent that a set of new opinion

leaders were highlighted with the use of NRM and their participation also could be utilized in the building of cooperative environment for the information diffusion.

However, in means of betweenness centrality it is clearly visible that opinion leaders of the social network derived on the New Rules of Measurement have a higher control over the network as the information is considerably passing through them. Nevertheless, same set of actors are highlighted as the Opinion leaders in respect for two innovations where they are identified by the information disseminators as each social network. Accordingly, it is apparent that the act of opinion leaders is varied with the type of innovation and they represent a dynamic performance with the innovations which are clearly in practice and rather reachable and accessible in their individual and organizational context.

4.12 Summary of the Research Findings

The derived SN with respect to communicational network aided in identification of OPs in the social system. The analysis on the both approaches finally accumulated in the achieving simultaneously the aim of the research and the final objective of 03 and objective 04. The behaviour of the SN was accentuated through the properties of the network, where rational conclusions were arrived through the statistical data on the network. A clear identification of opinion leaders and opinion seekers were gained where the dissemination of the innovation through the SN is considerably at an initial stage along with interconnectivity among each actor. Organizational level of information transmission was also visible where most of opinion seekers are conveyed on the innovative software through the indirect linkage from the most influential actors.

5.0 CONCLUSIONS AND RECOMMENDATIONS

The chapter initiated with arriving to conclusion upon the analysis conducted in the preceding chapter four. Additionally, summary to the research is comprehended and further recommendation have been inscribed for the improvement of the research area. Limitations to the research is specified while amplifying further research areas to be carried out

5.1 Summary of the Research Study

Use of innovative approaches and technologies is minimum among QSs within the Sri Lankan context highlighting that reachability towards global context is consequently limited. Nevertheless, it is vital for the implementation of innovation to encourage construction field to walk up with global situation. The DOI intend the nature of the social system and its environment in the progression where innovation proceeds. Consequently, the context of the social system and the conduct of the individuals inside it is important in integrating a definite innovation to a social system. Thus, it was required to evaluate the behaviour of the Social Networks among Sri Lankan QSs which is unidentified based on the innovation context and consequently using it to understand the existing performance of it while spotting Opinion leaders among the social system. In fast-tracked innovation dissemination the influence from Opinion leaders is highly related and hence, it is required to identify opinion leaders among QSs with relevant to different social systems. Nevertheless, their influence in the field of Quantity Surveying is unknown and they could be utilized in recognising their influence to existing innovation diffusion and for the further improvements of the field.

Significantly to Quantitative approach was utilized as the aim focuses opinion leadership among adopter categories of Quantity Surveying innovations has affected their diffusion. Henceforth Social Network Analysis is utilized through narrowing down the communicational network to identify the opinion leaders in each respective innovation categories. Thus, socio metric method was applied as the procedure of locating Opinion Leaders where data collection was limited to the sample of QSs of Western province. Through the SNA, relating to measures of cohesion and measures of centrality, the nature and the behaviour of the social networks were identified

Consequently, the nature of behaviour of the opinion leaders were emphasised, and their active participation was highlighted through their identified characteristics and thus their activism could be effectually utilized for the effective dissemination of innovation.

5.2 Conclusion

Adoption of innovation is moderately low within Sri Lankan context, by Quantity Surveyors which influence in the deaccelerated diffusion of innovation within entire social system. Therefore, the necessity of Opinion Leaders as a significant character motivating the collaborating social system is vital in active diffusion of innovation.

Objective I: Identification of key components in the diffusion of innovation and critical factor for the adoption of innovation.

The concept of DOI corresponds with the innovation, the social system in which it diffuses, the communication channels it is using and the time period. Thus, innovations explicit of the new idea or notions and concepts in corresponding to a certain context in which it has not been used or adopted. Hence in general construction context four categories of innovation is founded where it is limited to two types in respect to the innovation types introduced in respect to DOI concept. Additionally, the five perceived attributes of innovation were identified along with the categories of innovation decision making. Correspondently, the difference between the process of the individual adoption of innovation and process for adoption of an innovation in the context of organization context was identified. Thus, five critical actors for the rate of adoption and three major criteria are impacting on the organizational adoption of innovation.

Objective II: Identification of adopter categories and opinion leadership with relation to diffusion of Innovation.

With relevance to the innovation adoption five adopter categories were identified along with their unique characteristics. Thus, similar characteristics were observed among the early adopters and the opinion leaders where key characteristics of the opinion leaders could be divided in to six main categories. Additionally, the relationship among the Change Agents, Opinion Leaders and the Consumer Mass was

identified in relevance the communicational channels in use, while focusing on the effective role of opinion leaders in the diffusion of innovation.

Objective III: Identification of structure of social network among Quantity Surveyors of Sri Lanka corresponding to different categories of innovation.

Through the research the behaviour of the Social Network was identified in respect to the understanding of communicational network from a sample of QSs where its' properties exemplified the behaviour of QSs within it. The study revealed on the identification of information seekers and information disseminators where major respondents were located to be information seekers where the one-way information and knowledge transmission is considered. The network consisted with direct interactions well as indirect interactions with firm QSs with knowledge. The information interactions among QSs is visible within the organizational context and exterior to it but on limited context. With the deviation of the innovative aspects the behaviour of the actors and the whole social system differs which imply the impact of the innovation category in the diffusion of innovation.

It is apparent that nature of the social system is more active with the innovation which is more easily accessible and more easily usable and understandable with in a community. Thus, Quantity Surveyors are more connected and reachable irrespective of their usage to the most significant innovation for them in individual context which is identified to be optional category of innovation diffusion. However, in terms of the technology related software, the behaviour of the social system is moderately active where the actors are not much enthusiastic to be information disseminators. Thus, it is vibrant that the Quantity Surveyors are more towards the preventive innovation category as the individual has the flexibility to adopt or reject the innovation. Thus, the behaviour of the social networks with the incremental innovation types which included technological innovations shows a moderately less active participation within the network. Hence it is apparent that QSs are much more forwarded to the innovations which is in relations to their core area basically as per this research in terms of measurement. Since they have the basic knowledge on their core subject area innovations arisen in such a category would easily penetrate through them irrespective of their usage.

Objective IV: Identification of status of the opinion leaders among Quantity Surveyors corresponding to different categories of innovation

This context is applicable in the behaviour of the opinion leaders where higher interaction is visible within the opinion leaders on the social network derived on New Rules of measurement innovation. It was apparent that only a selected actor of the social network was identified to be the opinion leaders in terms of incremental innovation which was applicable for the derived social networks on software. In contrast, a separate set of opinion leaders irrespective of two actors identified earlier with software innovation presented higher interactions and higher dominance over the social network. Hence it is clearly visible that opinion leaders are cooperative with the social network in which they are tempting and adaptive to preventive innovation. Additionally, opinion leaders are repetitive behaviour in the considered three innovations but their strategic locations within the network is differed.

Discussing the outcomes in relation to the literature findings it is well reflected that in terms of professional opinion leaders in other sectors concerning to medical health and clinical sector, it is well observed opinion leaders are deepened upon the research process and there is no significant realization of change of the opinion leaders in respect to their various studies. This is well fitted with the results of the research conducted by Lococka, Dopsonb ,Chambersc , Gabbay (2011) on opinion leaders ‘s role in improvement of clinical. Additionally, as per the study by Flodgren, et al., (2007) opinion leaders being alone or together might successfully promote innovative practices but it depends upon the varied studies varying form involvement perspective, background and the results concerning on opinion leadership on professional practice and health care outcomes. Thus, it is evident that in the Quantity Surveying practice, same opinion leaders are not applicable for every context of innovation diffusion but could use collaboratively in the diffusion process.

Accordingly, as per (Muller & Peres, 2019) structural characteristics of social network should be combined into research on novel product growth. However, concerning to quantity Surveying context, network structure varies with the considered innovation and cohesive networks would be visualized among the networks developed in relation to innovation concerning core areas of Quantity Surveying practices.

5.3 Limitations of the Research

Limitations came forward within the continuation of the study are explicated for the reader to

- Sample for the data collection was limited to QSs within Western province of Sri Lanka due to the larger population size and in order to arrive at a clear network to identify opinion leaders of each network.
- Innovations to locate opinion leaders was limited to Quantity Surveying related software including CostX and AutoCAD and NRM considering the unitization among QSs
- Considered communicational network for the deriving of the social network among QSs in order to identify the opinion leaders with more connectivity.
- SNA conducted through UCINET was restricted to limited number of measures which are key measures in valuing the properties of social network.

5.4 Recommendations

Recommendation to the research could be comprehended utilising nature of the identified social networks and the behavioural patterns of the opinion leaders.

- Collaborative engagement of Change agents with the identified opinion leaders within the Quantity Surveying field.

Change agents being the primary individuals in the introduction of innovations to an organization could collaborate with the professional bodies and thus initiate their knowledge transfer through the influential opinion leaders. Though this multiple organizations could benefit with their active engagement and cooperative assistance in the knowledge dissemination.

- Encouraging contracting or consulting organizations in leading budget plans for the implementation of technological innovations.

Most of the organizations identify a major hindrance of inadequate capital for the technology implementation. Thus, it is required a strong budget for the acquisition of

required software and other technological aspects for the organization. This could facilitate in the preventive innovation diffusion.

- Introduction of beneficial computer software collaboratively through respective international organizations for capable construction and contracting organizations within Sri Lanka.

Since most of the innovative approaches are related to computer software, it would be beneficial in introducing them to organizations with financial feasibility for purchasing the required licence. Thus, this would benefit in more involvement of QSs in innovative computer software in organizational context enabling in the effective dissemination of innovative solutions.

- Conduction of CPD sessions, technical sessions collaboratively through opinion leaders to the Quantity Surveying community regarding upcoming innovation in global context.

The general population of QSs are not subjected to more innovative approaches owing to numerous limitations namely absence of knowledge and lack of resource in addition to practice through their professional career. Thus, it would be beneficial in conducting sessions on educational background of these computer related software where knowledge could be massively disseminated over the whole population of QSs. Accordingly, the QSs would be more competent and would have basic knowledge and experience within their career.

5.5 Further Research Directions

Numerous further research directions could be identified to engulf the considered limitations within the study.

- Utilization of mathematical approach in deriving Social network to identify the general behaviour among Quantity Surveyors.
- Defining their comparative significance to growth of innovation with a combined set of structural features considering social networks

- Measuring innovation's potential on the context of the underlying social network underlying to a target market.

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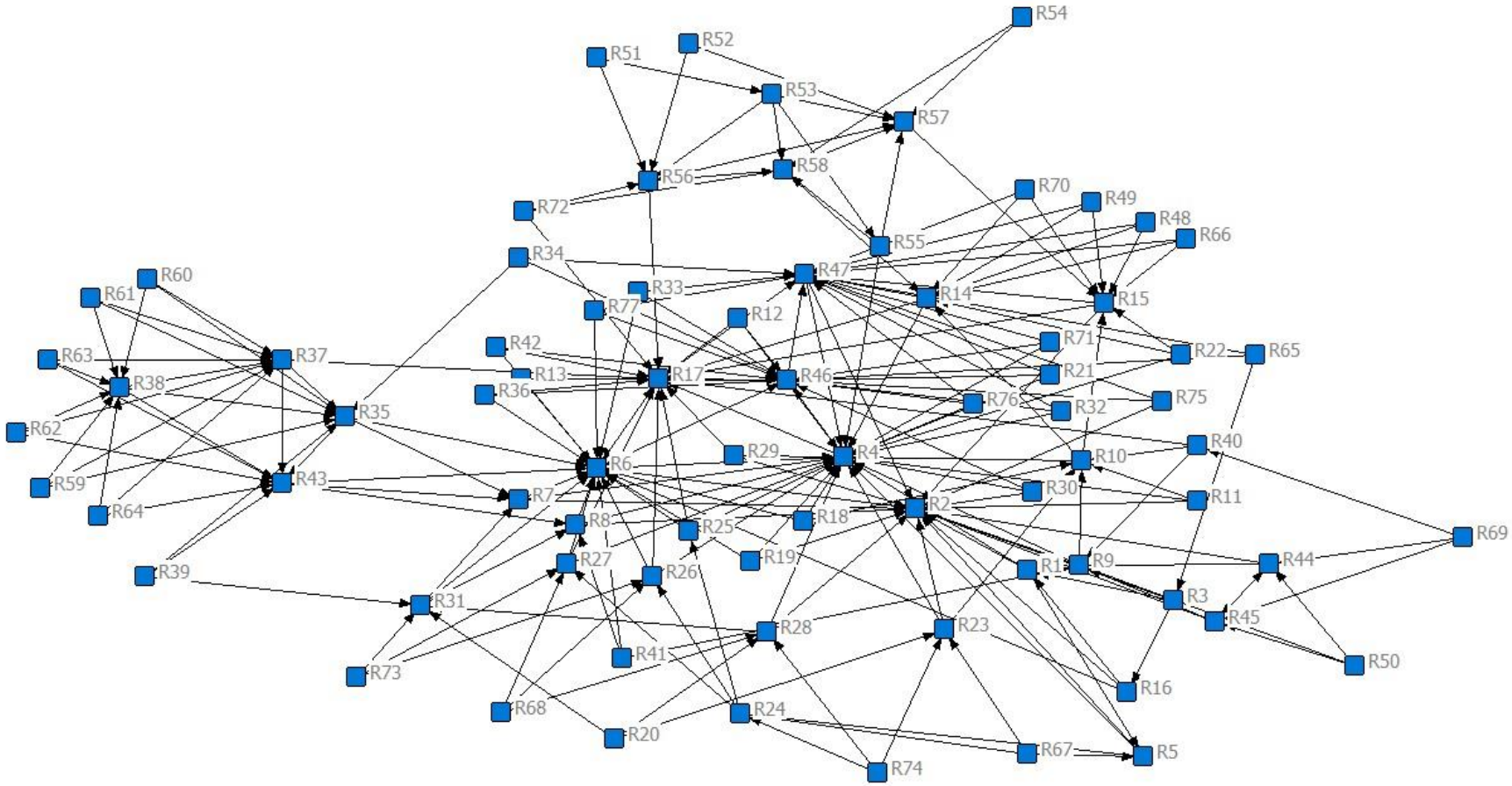
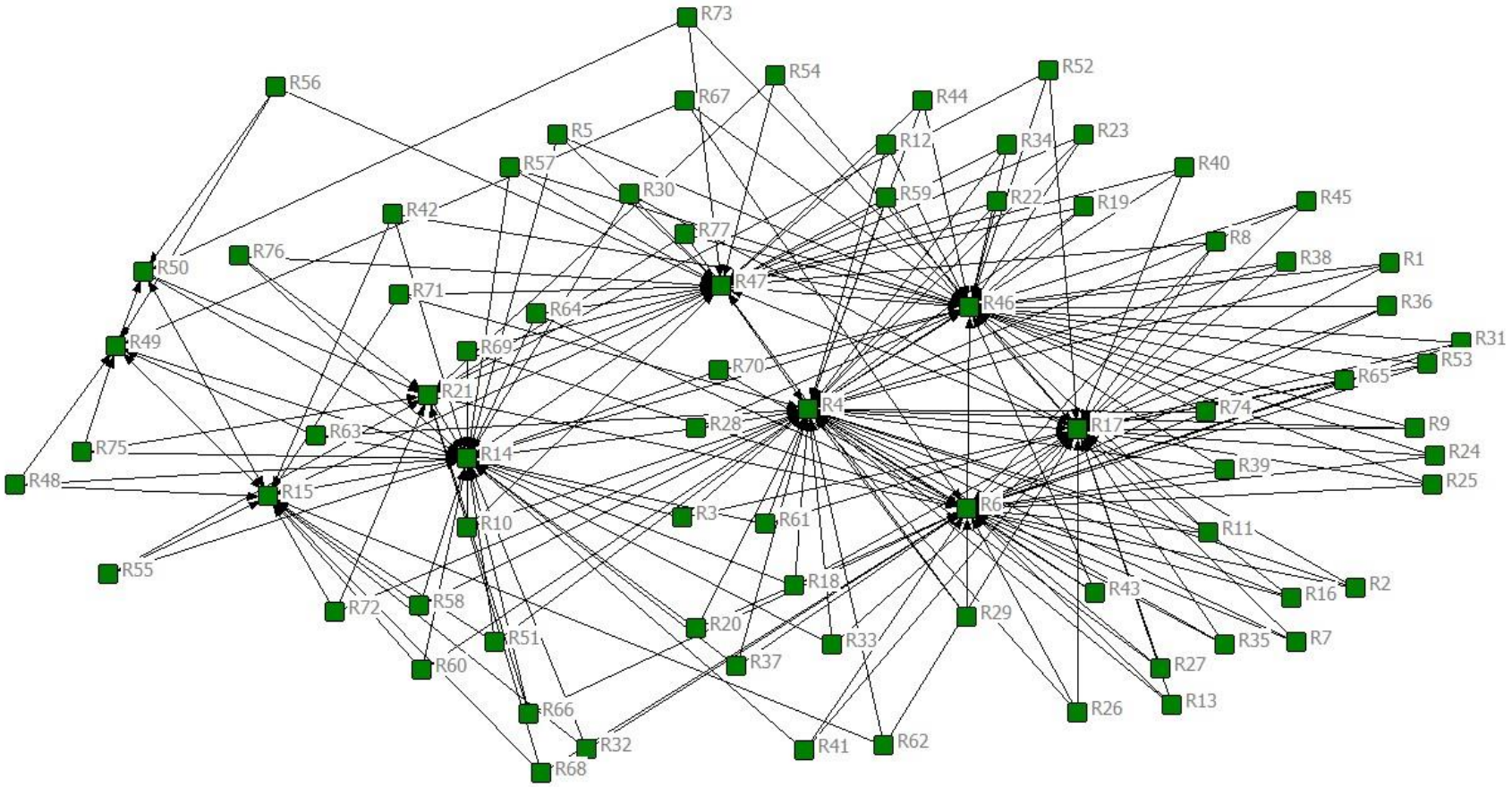
APPENDIXES

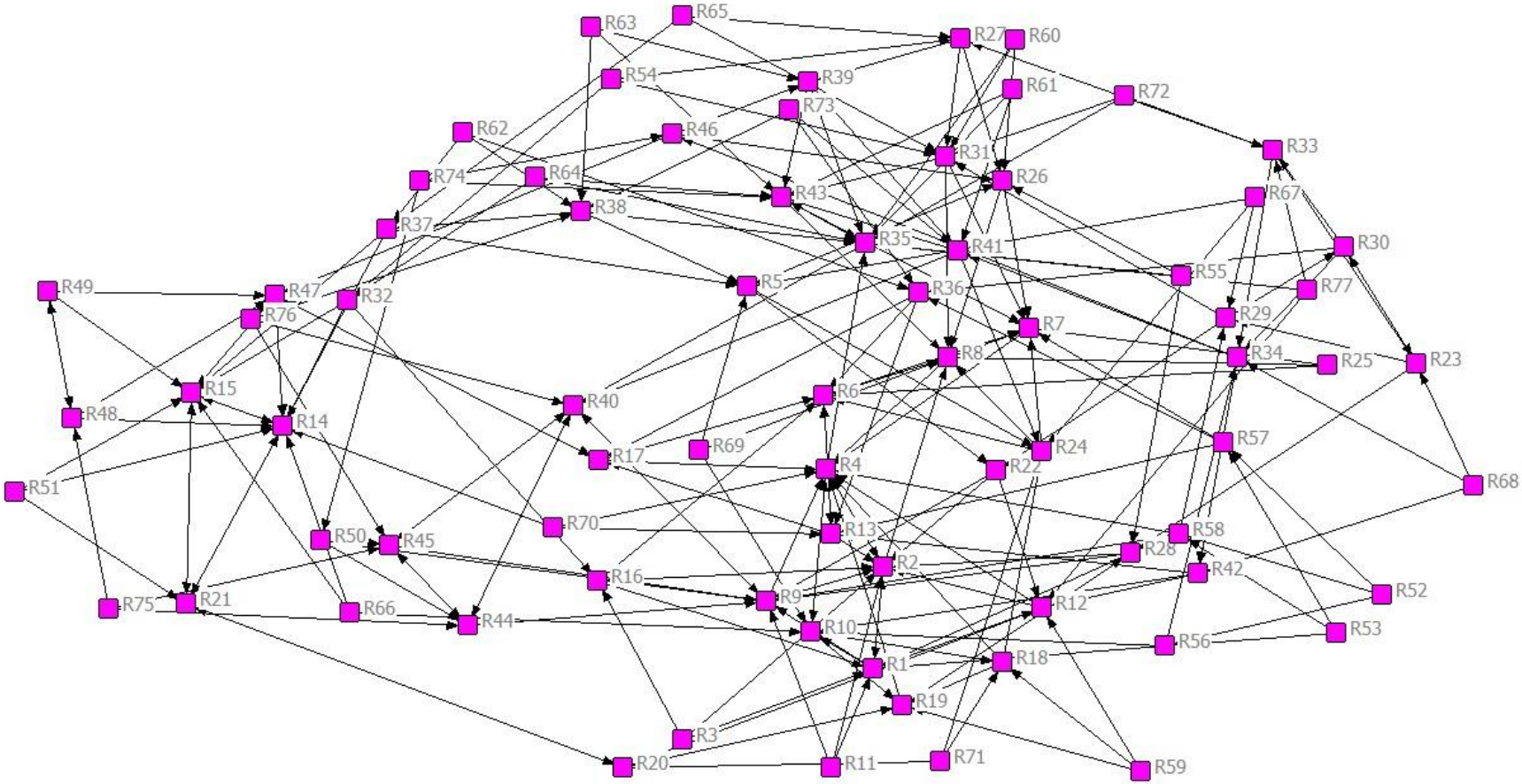
Appendix- A(I): Derived Social Network of Quantity Surveyors in respect to the innovation of AutoCAD software



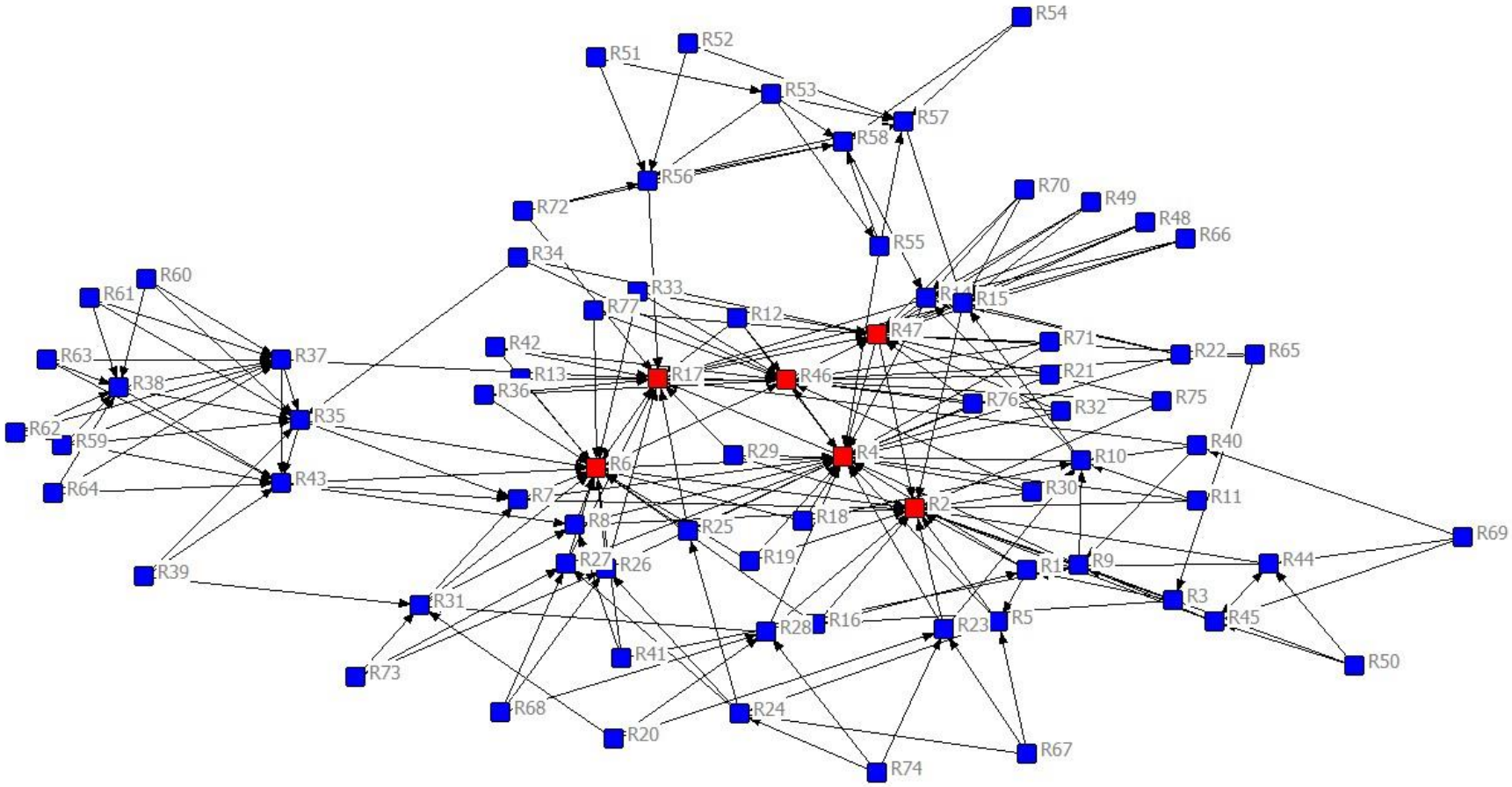
Appendix- A(II): Derived Social Network of Quantity Surveyors in respect to the innovation of CostX software



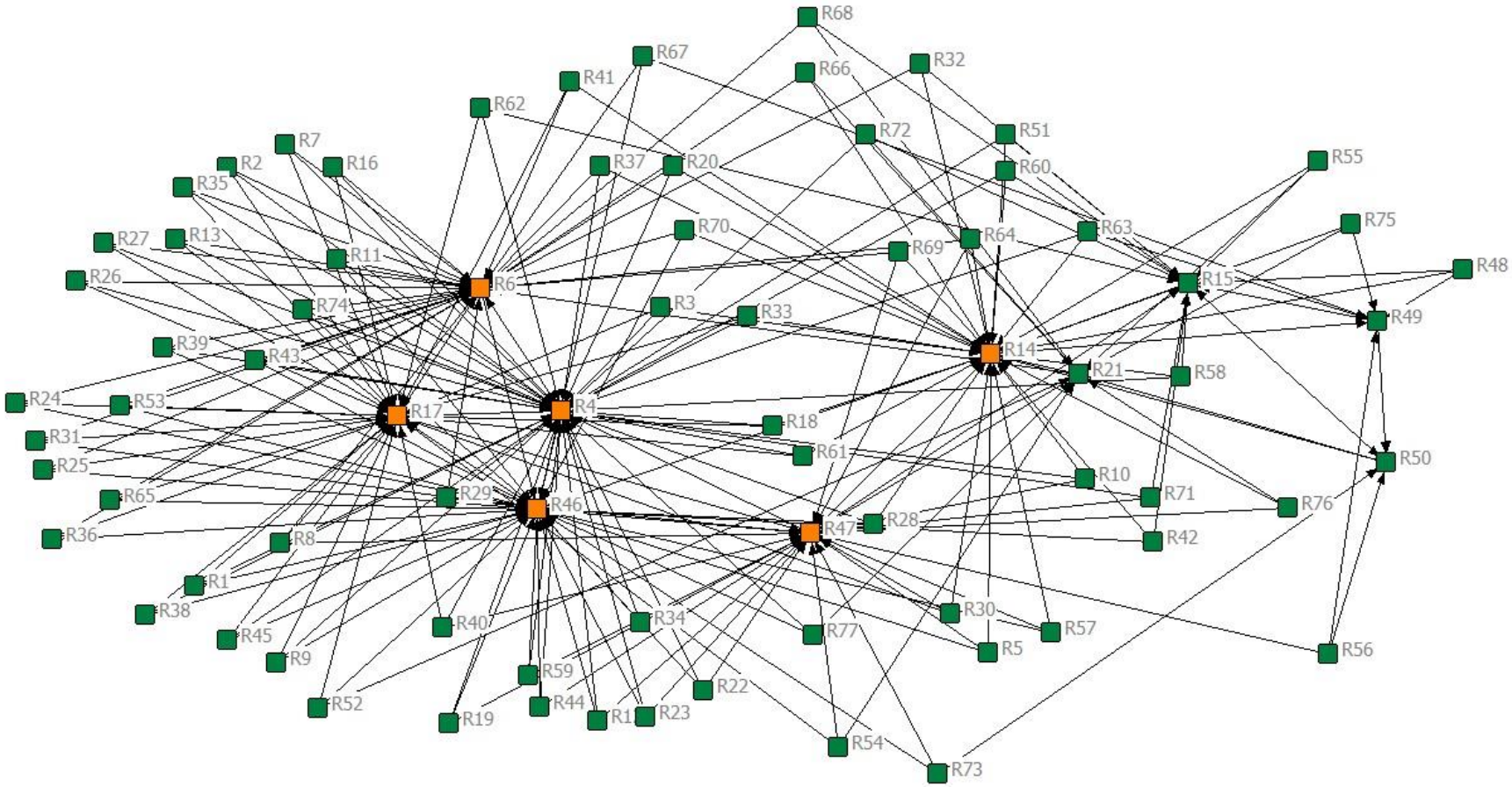
Appendix- A(III): Derived Social Network of Quantity Surveyors in respect to the innovation of New Rules f Measurement



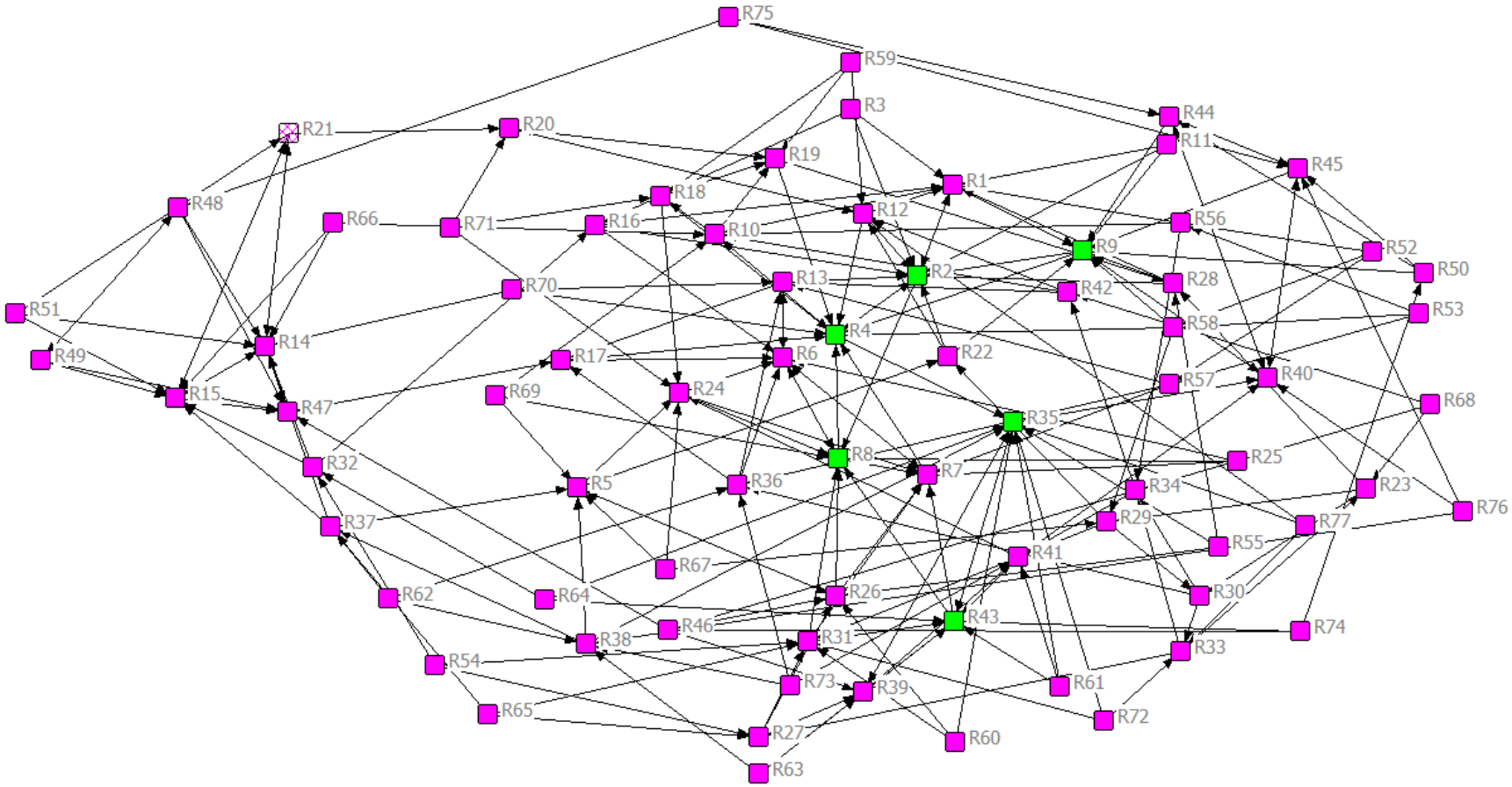
Appendix- B(I): Identified opinion leaders in the derived social network for the innovation of AutoCAD



Appendix- B(II): Identified opinion leaders in the derived social network for the innovation of CostX



Appendix- B(III): Identified opinion leaders in the derived social network for the innovation of New Rules of Measurement



Appendix C – Glossary for the measures of Social Network (Further explanation)

Measures of Cohesion	
Network Density	In binary network data, density is the proportion of actual nominations among the total possible number of nominations It denotes the proportion of all the probable ties present within the network which also denoted as a percentage for the representation of value.
Actor Degree	No of ties in the social network
Reachability	The existence of any connections in trace from source to the target actor irrespective of any actors in-between, the actor considered to be reachable where reachability indicates direct or indirect way of connection of two actors of any length Further, the reachability depends upon the data in which is directed or asymmetric a specific actor could reach another but vies versa is not possible with undirected or symmetric data where pair of actors would be reachable or not to the
Point Connectivity	The number of nodes that would have to be removed in order for one actor to no longer be able to reach another. If there are many different pathways that connect two actors, they have high "connectivity" in the sense that there are multiple ways for a signal to reach from one to the other.
Geodesic Distance	The length of the Geodesic path or shortest path
Measures of Centrality	
Degree Centrality	Number of ties a node has compared to other nodes in the network
Closeness Centrality	Measures how close a node is to each of the other nodes in the network. Network members with higher closeness centrality are assumed to be better connected,
Betweenness Centrality	Measures the extent to which a node is an important intermediary between other members' connections in the social network. It reflects the number of shortest paths connecting any pair of nodes that pass through that particular node.

Appendix – D (I): Interview Guideline for the identification of innovation for the development of Social Networks

QUESTIONNAIRE GUIDELINE

MSc by Research, Postgraduate,
Department of Building Economics,
University of Moratuwa.

……
……
……

Dear Sir/ Madam,

Conducting a Expert Interview for MSc by Research Thesis

I am a postgraduate student of Faculty of Graduate Studies, University of Moratuwa following MSc by Research Degree. In order to fulfil the requirements of this degree, it is required to undertake a research and produce a thesis.

My selected topic is **"Identification of Cooperative Environment for the Diffusion of Innovation in the field of Quantity Surveying".** My main concern is to develop social networks among the identified innovations and to examine the behaviour of each network and the behaviour of individuals in them.

In order to gather data for the abovementioned topic, I wish to conduct a **Interview** among the Quantity surveyor in order identify the innovations in utilized by Sri Lankan Quantity Surveyors to construct the communication networks. Therefore, I kindly request your assistance to conduct the survey for the aforementioned topic.

The questionnaire guideline in consisted with three main sections as follows;

- General information about the respondents.
- Innovation you are currently practising and eager to practise in future in field of Quantity Surveying

I have recognized you as an eligible participant who could provide me valuable information to this research since you have practicing new technologies within your career.

I strongly believe that you could support my research by providing your views related to my research topic. **The information collected through this survey will be kept strictly confidential and should be used only for the purpose of the thesis. Any of your personnel information will not be disclosed within the research.**

Thank you.

Yours faithfully,

Postgraduate Student,
Kolugala L.M.B.N.
Department of Building Economics
University of Moratuwa

Supervisor,
Ch. QS. Suranga Jayasena
Senior Lecturer
Department of Building Economics
University of Moratuwa

QUESTIONNAIRE INTERVIEW – IDENTIFICATION OF COOPERATIVE ENVIRONMENT FOR THE DIFFUSION OF INNOVATION IN THE FIELD OF QUANTITY SURVEYING

Basic Information

Name =

Organization =

Position =

Years of Experience =

1. What are the types of innovations in the field of Quantity Surveying that are practising by now / hoping to practice in near future and how many years are you using the current practising innovation them?

No	Innovation particular to field of Quantity Surveying	No of years
1		
2		
3		
4		
5		
	Innovations to be practiced and hope to use in future	

Appendix – D (II): Sample Interview Guideline for the identification of innovation for the development of Social Networks

QUESTIONNAIRE GUIDELINE

MSc by Research, Postgraduate,
Department of Building Economics,
University of Moratuwa.

……
……
……

Dear Sir/ Madam,

Conducting a Expert Interview for MSc by Research Thesis

I am a postgraduate student of Faculty of Graduate Studies, University of Moratuwa following MSc by Research Degree. In order to fulfil the requirements of this degree, it is required to undertake a research and produce a thesis.

My selected topic is **"Identification of Cooperative Environment for the Diffusion of Innovation in the field of Quantity Surveying".** My main concern is to develop social networks among the identified innovations and to examine the behaviour of each network and the behaviour of individuals in them.

In order to gather data for the abovementioned topic, I wish to conduct a **Interview** among the Quantity surveyor in order identify the innovations in utilized by Sri Lankan Quantity Surveyors to construct the communication networks. Therefore, I kindly request your assistance to conduct the survey for the aforementioned topic.

The questionnaire guideline in consisted with three main sections as follows;

- General information about the respondents.
- Innovation you are currently practising and eager to practise in future in field of Quantity Surveying

I have recognized you as an eligible participant who could provide me valuable information to this research since you have practicing new technologies within your career.

I strongly believe that you could support my research by providing your views related to my research topic. **The information collected through this survey will be kept strictly confidential and should be used only for the purpose of the thesis. Any of your personnel information will not be disclosed within the research.**

Thank you.

Yours faithfully,

Postgraduate Student,
Kolugala L.M.B.N.
Department of Building Economics
University of Moratuwa

Supervisor,
Ch. QS. Suranga Jayasena
Senior Lecturer
Department of Building Economics
University of Moratuwa

EXPERT INTERVIEW – IDENTIFICATION OF COOPERATIVE ENVIRONMENT FOR THE DIFFUSION OF INNOVATION IN THE FIELD OF QUANTITY SURVEYING

Basic Information

Name = xxxxxxx

Organization = yyyyyy

Position = Senior Quantity Surveyor

Years of Experience = 17

2. What are the types of innovations in the field of Quantity Surveying that are practising by now / hoping to practice in near future and how many years are you using the current practising innovation them?

No	Innovation particular to field of Quantity Surveying	No of years
1	AutoCAD	7
2	CostX	7
3		
4		
5		
	Innovations to be practiced and hope to use in future	
1	e-procurment	
2	NRM	

Appendix – D (III): Questionnaire for the development of Social Networks

QUESTIONNAIRE GUIDELINE

MSc by Research, Postgraduate,
Department of Building Economics,
University of Moratuwa.

……
……
……

Dear Sir/ Madam,

Conducting a Questionnaire Survey for MSc by Research Thesis

I am a postgraduate student of Faculty of Graduate Studies, University of Moratuwa following MSc by Research Degree. In order to fulfil the requirements of this degree, it is required to undertake a research and produce a thesis.

My selected topic is **"Identification of Cooperative Environment for the Diffusion of Innovation in the field of Quantity Surveying".** My main concern is to develop social networks among the identified innovations and to examine the behaviour of each network and the behaviour of individuals in them.

In order to gather data for the abovementioned topic, I wish to conduct a **Survey** among the Quantity surveyor in order to construct the communication networks. Therefore, I kindly request your assistance to conduct the survey for the aforementioned topic.

The questionnaire guideline in consisted with three main sections as follows;

- General information about the respondents.
- Communication network in respect of seeking opinion on the use of software of AutoCAD, CostX and New Rules of Measurement
- Commination mode with the respective personnel

I have recognized you as an eligible participant who could provide me valuable information to this research since you have practicing new technologies within your career.

I strongly believe that you could support my research by providing your views related to my research topic. **The information collected through this survey will be kept strictly confidential and should be used only for the purpose of the thesis. Any of your personnel information will not be disclosed within the research.**

Thank you.

Yours faithfully,

Postgraduate Student,
Kolugala L.M.B.N.
Department of Building Economics
University of Moratuwa

Supervisor,
Ch. QS. Suranga Jayasena
Senior Lecturer
Department of Building Economics
University of Moratuwa

QUESTIONNAIRE SURVEY – IDENTIFICATION OF COOPERATIVE ENVIRONMENT FOR THE DIFFUSION OF INNOVATION IN THE FIELD OF QUANTITY SURVEYING

Basic Information

Name =

Organization =

Position =

Years of Experience =

Innovation: The use of AutoCAD, CostX and New Rules of Measurement in the practice of Quantity Surveying

1. Who do you look to for opinions (better ways of doing) in respect to the field of quantity surveying in the use of the software **AutoCAD, CostX and New Rules of Measurement?** (Fill in the following tables and use the following scales to indicate the communication basis with each person)

AutoCAD Software

No	Name	Position	Organization
1			
2			
3			

CostX Software

No	Name	Position	Organization
1			
2			
3			

New Rules of Measurement

No	Name	Position	Organization
1			
2			
3			

Appendix - D (IV): Sample Questionnaire for the development of Social Networks

QUESTIONNAIRE GUIDELINE

MSc by Research, Postgraduate,
Department of Building Economics,
University of Moratuwa.

……
……
……

Dear Sir/ Madam,

Conducting a Questionnaire Survey for MSc by Research Thesis

I am a postgraduate student of Faculty of Graduate Studies, University of Moratuwa following MSc by Research Degree. In order to fulfil the requirements of this degree, it is required to undertake a research and produce a thesis.

My selected topic is **"Identification of Cooperative Environment for the Diffusion of Innovation in the field of Quantity Surveying".** My main concern is to develop social networks among the identified innovations and to examine the behaviour of each network and the behaviour of individuals in them.

In order to gather data for the abovementioned topic, I wish to conduct a **Survey** among the Quantity surveyor in order to construct the communication networks. Therefore, I kindly request your assistance to conduct the survey for the aforementioned topic.

The questionnaire guideline in consisted with three main sections as follows;

- General information about the respondents.
- Communication network in respect of seeking opinion on the use of software of AutoCAD, CostX and New Rules of Measurement
- Commination mode with the respective personnel

I have recognized you as an eligible participant who could provide me valuable information to this research since you have practicing new technologies within your career.

I strongly believe that you could support my research by providing your views related to my research topic. **The information collected through this survey will be kept strictly confidential and should be used only for the purpose of the thesis. Any of your personnel information will not be disclosed within the research.**

Thank you.

Yours faithfully,

Postgraduate Student,
Kolugala L.M.B.N.
Department of Building Economics
University of Moratuwa

Supervisor,
Ch. QS. Suranga Jayasena
Senior Lecturer
Department of Building Economics
University of Moratuwa

QUESTIONNAIRE SURVEY – IDENTIFICATION OF COOPERATIVE ENVIRONMENT FOR THE DIFFUSION OF INNOVATION IN THE FIELD OF QUANTITY SURVEYING

Basic Information

Name =

Organization =

Position =

Years of Experience =

Innovation: The use of AutoCAD, CostX and New Rules of Measurement in the practice of Quantity Surveying

2. Who do you look to for opinions (better ways of doing) in respect to the field of quantity surveying in the use of the software **AutoCAD, CostX and New Rules of Measurement?** (Fill in the following tables and use the following scales to indicate the communication basis with each person)

AutoCAD Software

No	Name	Position	Organization
1	A	Senior Quantity Surveyor	
2	B	Quantity Surveyor	
3	C	Quantity Surveyor	

CostX Software

No	Name	Position	Organization
1	A	Senior Quantity Surveyor	
2	E	Quantity Surveyor	
3	F	Quantity Surveyor	

New Rules of Measurement

No	Name	Position	Organization
1	E	Quantity Surveyor	
2	J	Quantity Surveyor	
3	I	Quantity Surveyor	

Appendix - E (I): UCINET results on Actor degree density of the Social Network on the innovation of Auto CAD

Dimension to analyze: Columns
Diagonal valid: NO

Statistics

	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20	R21	R22	R23	R24	R25	R26	R27	R28	R29	R30	R31	R32	R33
1 Observations	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76
2 Missing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3 Minimum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4 Maximum	1	1	1	1	1	1	1	1	1	1	0	0	0	1	1	1	1	0	0	0	0	0	1	1	1	1	1	1	0	0	1	0	0
5 Sum	2	18	1	26	2	21	4	4	5	5	0	0	0	7	7	1	18	0	0	0	0	0	3	3	1	3	3	3	0	0	4	0	0
6 Average	0.026	0.237	0.013	0.342	0.026	0.276	0.053	0.053	0.066	0.066	0	0	0	0.092	0.092	0.013	0.237	0	0	0	0	0	0.039	0.039	0.013	0.039	0.039	0.039	0	0	0.053	0	0
7 SSQ	2	18	1	26	2	21	4	4	5	5	0	0	0	7	7	1	18	0	0	0	0	0	3	3	1	3	3	3	0	0	4	0	0
8 Standard Deviation	0.16	0.425	0.114	0.474	0.16	0.447	0.223	0.223	0.248	0.248	0	0	0	0.289	0.289	0.114	0.425	0	0	0	0	0	0.195	0.195	0.114	0.195	0.195	0.195	0	0	0.223	0	0
9 Variance	0.026	0.181	0.013	0.225	0.026	0.2	0.05	0.05	0.061	0.061	0	0	0	0.084	0.084	0.013	0.181	0	0	0	0	0	0.038	0.038	0.013	0.038	0.038	0.038	0	0	0.05	0	0
10 MCSSQ	1.947	13.74	0.987	17.105	1.947	15.197	3.789	3.789	4.671	4.671	0	0	0	6.355	6.355	0.987	13.737	0	0	0	0	0	2.882	2.882	0.987	2.882	2.882	2.882	0	0	3.789	0	0
11 Euclidean Norm	1.414	4.243	1	5.099	1.414	4.583	2	2	2.236	2.236	0	0	0	2.646	2.646	1	4.243	0	0	0	0	0	1.732	1.732	1	1.732	1.732	1.732	0	0	2	0	0

	R34	R35	R36	R37	R38	R39	R40	R41	R42	R43	R44	R45	R46	R47	R48	R49	R50	R51	R52	R53	R54	R55	R56	R57	R58	R59	R60	R61	R62	R63	R64	R65	R66	R67
1 Observations	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76
2 Missing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3 Minimum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4 Maximum	0	1	0	1	1	0	1	0	0	1	1	1	1	1	0	0	0	0	0	1	0	1	1	1	1	0	0	0	0	0	0	0	0	0
5 Sum	0	7	0	7	6	0	1	0	0	7	3	3	17	17	0	0	0	0	0	1	0	1	6	6	6	0	0	0	0	0	0	0	0	0
6 Average	0	0.092	0	0.092	0.079	0	0.013	0	0	0.092	0	0	0.2	0.224	0	0	0	0	0	0	0	0	0.079	0.079	0.079	0	0	0	0	0	0	0	0	0
7 SSQ	0	7	0	7	6	0	1	0	0	7	3	3	17	17	0	0	0	0	0	1	0	1	6	6	6	0	0	0	0	0	0	0	0	0
8 Standard Deviation	0	0.289	0	0.289	0.27	0	0.114	0	0	0.289	0.2	0.2	0.4	0.417	0	0	0	0	0	0.1	0	0.1	0.27	0.27	0.27	0	0	0	0	0	0	0	0	0
9 Variance	0	0.084	0	0.084	0.073	0	0.013	0	0	0.084	0	0	0.2	0.174	0	0	0	0	0	0	0	0	0.073	0.073	0.073	0	0	0	0	0	0	0	0	0
10 MCSSQ	0	6.355	0	6.355	5.526	0	0.987	0	0	6.355	2.9	2.9	13	13.2	0	0	0	0	0	1	0	1	5.526	5.526	5.526	0	0	0	0	0	0	0	0	0
11 Euclidean Norm	0	2.646	0	2.646	2.449	0	1	0	0	2.646	1.7	1.7	4.1	4.123	0	0	0	0	0	1	0	1	2.449	2.449	2.449	0	0	0	0	0	0	0	0	0

	R68	R69	R70	R71	R72	R73	R74	R75	R76	R77
1 Observations	76	76	76	76	76	76	76	76	76	76
2 Missing	0	0	0	0	0	0	0	0	0	0
3 Minimum	0	0	0	0	0	0	0	0	0	0
4 Maximum	0	0	0	0	0	0	0	0	0	0
5 Sum	0	0	0	0	0	0	0	0	0	0
6 Average	0	0	0	0	0	0	0	0	0	0
7 SSQ	0	0	0	0	0	0	0	0	0	0
8 Standard Deviation	0	0	0	0	0	0	0	0	0	0
9 Variance	0	0	0	0	0	0	0	0	0	0
10 MCSSQ	0	0	0	0	0	0	0	0	0	0
11 Euclidean Norm	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0

Appendix - E (II) UCINET results on Reachability of the Social Network on the innovation of Auto CAD

	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20	R21	R22	R23	R24	R25	R26	R27	R28	R29	R30	R31	R32	R33	R34	R35	R36	R37	R38	R39	R40	R41	R42	R43	R44	R45	R46	R47	R48	R49	R50	R51	R52	R53	R54	R55	R56	R57	R58	R59	R60	R61	R62	R63	R64	R65	R66	R67	R68	R69	R70	R71	R72	R73	R74	R75	R76	R77
1 R1	0	1	0	1	1	1	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2 R2	0	0	0	1	0	1	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3 R3	1	1	0	1	1	1	1	1	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4 R4	0	1	0	0	0	1	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5 R5	0	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6 R6	0	1	0	1	0	0	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7 R7	0	1	0	1	0	1	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8 R8	0	1	0	1	0	1	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9 R9	0	1	0	1	0	1	1	1	0	1	0	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 R10	0	1	0	1	0	1	1	1	0	0	0	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 R11	0	1	0	1	0	1	1	1	0	1	0	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12 R12	0	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13 R13	0	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14 R14	0	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15 R15	0	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16 R16	1	1	0	1	1	1	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17 R17	0	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18 R18	0	1	0	1	0	1	1	1	0	1	0	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19 R19	0	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20 R20	0	1	0	1	0	1	1	1	0	1	0	0	0	1	1	0	1	0	0	0	0	0	1	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21 R21	0	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22 R22	0	1	0	1	0	1	1	1	0	0	0	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23 R23	0	1	0	1	0	1	1	1	0	1	0	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24 R24	0	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25 R25	0	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26 R26	0	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27 R27	0	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28 R28	0	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29 R29	0	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30 R30	0	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31 R31	0	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32 R32	0	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33 R33	0	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34 R34	0	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35 R35	0	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36 R36	0	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
37 R37	0	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38 R38	0	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39 R39	0	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40 R40	0	1	0	1	0	1	1	1	1	1	0	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
41 R41	0	1	0	1	0	1	1	1	1	1	0	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
42 R42	0	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
43 R43	0	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
44 R44	0	1	0	1	0	1	1	1	1	1	0	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
45 R45	0	1	0	1	0	1	1	1	1	1	0	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
46 R46	0	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
47 R47	0	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
48 R48	0	1	0	1	0	1	1	1	0	0	0	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
49 R49	0	1	0	1	0	1	1	1	0	0	0	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50 R50	0	1	0	1	0	1	1	1	1	1	0	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
51 R51	0	1	0	1	0	1	1	1	0	0	0	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	1	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
52 R52	0	1	0	1	0	1	1	1	0	0	0	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
53 R53	0	1	0	1	0	1	1	1	0	0	0	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
54 R54	0	1	0	1	0	1	1	1	0	0	0	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
55 R55	0	1	0	1	0	1	1	1	0	0	0	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
56 R56	0	1	0	1	0	1	1	1	0	0	0	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
57 R57	0	1	0	1	0	1	1	1	0	0	0	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
58 R58	0	1	0	1	0	1	1	1	0	0	0	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
59 R59	0	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	0	0	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
60 R60	0	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	0	0	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
61 R61	0	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	0	0	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
62 R62	0	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	0	0	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
63 R63	0	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	0	0	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
64 R64	0	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	0	0	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
65 R65	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
66 R66	0	1	0	1	0	1	1	1	0	0	0	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
67 R67	0	1	0	1	1	1	1	1	0	1	0	0	0	1	1	0	1	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
68 R68	0	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
69 R69	0	1	0	1	0	1	1	1	1	1	0	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
70 R70	0	1	0	1	0	1	1	1	0	0	0	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
71 R71	0	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
72 R72	0	1	0	1	0	1	1	1	0	0	0	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
73 R73	0	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
74 R74	0	1	0	1	0	1	1	1	0	1	0	0	0	1	1	0	1	0	0	0	0	0	1	1	1	1	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
75 R75	0	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
76 R76	0	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
77 R77	0	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Appendix - E (II) UCINET results on Point Connectivity of the Social Network on the innovation of Auto CAD

	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20	R21	R22	R23	R24	R25	R26	R27	R28	R29	R30	R31	R32	R33	R34	R35	R36	R37	R38	R39	R40
1 R1	0	3	0	3	1	3	1	1	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
2 R2	0	0	0	3	0	3	1	1	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3 R3	2	3	0	3	1	3	1	1	0	0	0	0	0	0	0	1	3	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
4 R4	0	1	0	0	0	3	1	1	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5 R5	0	2	0	3	0	3	1	1	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
6 R6	0	1	0	2	0	0	1	1	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7 R7	0	2	0	3	0	3	0	1	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8 R8	0	2	0	3	0	3	1	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9 R9	0	3	0	3	0	3	1	1	0	1	0	0	0	1	1	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 R10	0	2	0	3	0	3	1	1	0	0	0	0	0	1	1	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 R11	0	3	0	3	0	3	1	1	0	1	0	0	0	1	1	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12 R12	0	1	0	3	0	3	1	1	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13 R13	0	1	0	2	0	3	1	1	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14 R14	0	1	0	3	0	3	1	1	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15 R15	0	2	0	3	0	3	1	1	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16 R16	1	3	0	3	1	3	1	1	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
17 R17	0	1	0	2	0	3	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18 R18	0	2	0	3	0	3	1	1	0	1	0	0	0	1	1	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19 R19	0	2	0	3	0	3	1	1	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20 R20	0	3	0	3	0	3	2	2	0	1	0	0	0	1	1	0	3	0	0	0	0	0	1	0	0	0	0	1	0	0	2	0	0	0	0	0	0	0	0	0
21 R21	0	1	0	3	0	3	1	1	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22 R22	0	2	0	3	0	3	1	1	0	0	0	0	0	1	1	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23 R23	0	3	0	3	0	3	1	1	0	1	0	0	0	1	1	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24 R24	0	1	0	3	0	3	1	1	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
25 R25	0	1	0	3	0	3	1	1	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26 R26	0	1	0	3	0	3	1	1	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27 R27	0	1	0	3	0	3	1	1	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28 R28	0	3	0	3	0	3	2	2	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
29 R29	0	2	0	3	0	3	1	1	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30 R30	0	2	0	3	0	3	1	1	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31 R31	0	3	0	3	0	3	2	2	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32 R32	0	1	0	3	0	3	1	1	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33 R33	0	1	0	2	0	3	1	1	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34 R34	0	2	0	3	0	3	2	2	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
35 R35	0	3	0	3	0	3	3	2	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36 R36	0	1	0	2	0	3	1	1	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
37 R37	0	3	0	3	0	3	3	2	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
38 R38	0	3	0	3	0	3	3	2	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	1	0	0	0
39 R39	0	3	0	3	0	3	3	3	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0
40 R40	0	3	0	3	0	3	1	1	1	2	0	0	0	1	1	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
41 R41	0	3	0	3	0	3	1	2	1	1	0	0	0	1	1	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
42 R42	0	1	0	2	0	3	1	1	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
43 R43	0	3	0	3	0	3	2	2	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
44 R44	0	3	0	2	0	2	1	1	2	1	0	0	0	1	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
45 R45	0	3	0	2	0	2	1	1	2	1	0	0	0	1	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
46 R46	0	1	0	2	0	3	1	1	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
47 R47	0	1	0	3	0	3	1	1	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
48 R48	0	2	0	3	0	3	1	1	0	0	0	0	0	1	1	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
49 R49	0	2	0	3	0	3	1	1	0	0	0	0	0	1	1	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50 R50	0	3	0	2	0	2	1	1	3	1	0	0	0	1	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
51 R51	0	2	0	3	0	3	1	1	0	0	0	0	0	1	1	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
52 R52	0	2	0	2	0	2	1	1	0	0	0	0	0	1	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
53 R53	0	2	0	3	0	3	1	1	0	0	0	0	0	1	1	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
54 R54	0	2	0	2	0	2	1	1	0	0	0	0	0	1	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
55 R55	0	2	0	3	0	3	1	1	0	0	0	0	0	1	1	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
56 R56	0	2	0	3	0	3	1	1	0	0	0	0	0	1	1	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
57 R57	0	2	0	3	0	3	1	1	0	0	0	0	0	1	1	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
58 R58	0	2	0	3	0	3	1	1	0	0	0	0	0	1	1	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
59 R59	0	3	0	3	0	3	3	2	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	2	1	0	0
60 R60	0	3	0	3	0	3	3	2	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	2	1	0	0
61 R61	0	3	0	3	0	3	3	2	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	2	1	0	0
62 R62	0	3	0	3	0	3	3	2	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	1	0	0
63 R63	0	3	0	3	0	3	3	2	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	1	0	0
64 R64	0	3	0	3	0	3	3	2	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	1	0	0
65 R65	1	2	1	3	1	3	1	1	0	0	0	0	0	0	0	1	3	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
66 R66	0	2	0	3	0	3	1	1	0	0	0	0	0	1	1	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
67 R67	0	3	0	3	1	3	1	1	0	1	0	0	0	1	1	0	3	0	0	0	0	0	1	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
68 R68	0	2	0	3	0	3	2	2	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	1	1	1	0	0	1	0	0	0	0	0	0	0	0	0
69 R69	0	3	0	3	0	3	1	1	3	2	0	0	0	1	1	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
70 R70	0	2	0	3	0	3	1	1	0	0	0	0	0	1	1	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
71 R71	0	1	0	3	0	3	1	1	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
72 R72	0	2	0	3	0	3	1	1	0	0	0	0	0	1	1	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
73 R73	0	2	0	3	0	3	2	2	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0
74 R74	0	3	0	3	0	3	2	2	0	1	0	0	0	1	1	0	3	0	0	0	0	0	1	1	1	1	1	1	0	0	1	0	0	0	0	0	0	0	0	0
75 R75	0	2	0	3	0	3	1	1	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
76 R76	0	1	0	3	0	3	1	1	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
77 R77	0	1	0	2	0	3	1	1	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

	R41	R42	R43	R44	R45	R46	R47	R48	R49	R50	R51	R52	R53	R54	R55	R56	R57	R58	R59	R60	R61	R62	R63	R64	R65	R66	R67	R68	R69	R70	R71	R72	R73	R74	R75	R76	R77
1 R1	0	0	0	0	0	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2 R2	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3 R3	0	0	0	0	0	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4 R4	0	0	0	0	0	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5 R5	0	0	0	0	0	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6 R6	0	0	0	0	0	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7 R7	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8 R8	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9 R9	0	0	0	0	0	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 R10	0	0	0	0	0	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 R11	0	0	0	0	0	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12 R12	0	0	0	0	0	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13 R13	0	0	0	0	0	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14 R14	0	0	0	0	0	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15 R15	0	0	0	0	0	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16 R16	0	0	0	0	0	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17 R17	0	0	0	0	0	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18 R18	0	0	0	0	0	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19 R19	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20 R20	0	0	0	0	0	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21 R21	0	0	0	0	0	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22 R22	0	0	0	0	0	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23 R23	0	0	0	0	0	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24 R24	0	0	0	0	0	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25 R25	0	0	0	0	0	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26 R26	0	0	0	0	0	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27 R27	0	0	0	0	0	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28 R28	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29 R29	0	0	0	0	0	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30 R30	0	0	0	0	0	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31 R31	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32 R32	0	0	0	0	0	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33 R33	0	0	0	0	0	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34 R34	0	0	1	0	0	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35 R35	0	0	1	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36 R36	0	0	0	0	0	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
37 R37	0	0	2	0	0	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38 R38	0	0	3	0	0	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39 R39	0	0	2	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40 R40	0	0	0	0	0	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
41 R41	0	0	0	0	0	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
42 R42	0	0	0	0	0	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
43 R43	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
44 R44	0	0	0	0	1	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
45 R45	0	0	0	1	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
46 R46	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
47 R47	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
48 R48	0	0	0	0	0	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
49 R49	0	0	0	0	0	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50 R50	0	0	0	2	2	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
51 R51	0	0	0	0	0	3	3	0	0	0	0	0	1	0	1	3	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
52 R52	0	0	0	0	0	2	2	0	0	0	0	1	0	0	0	2	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
53 R53	0	0	0	0	0	3	3	0	0	0	0	0	0	0	1	3	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
54 R54	0	0	0	0	0	2	2	0	0	0	0	0	0	1	0	2	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
55 R55	0	0	0	0	0	3	3	0	0	0	0	0	0	0	0	2	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
56 R56	0	0	0	0	0	3	3	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
57 R57	0	0	0	0	0	3	3	0	0	0	0	0	0	0	0	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
58 R58	0	0	0	0	0	3	3	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
59 R59	0	0	3	0	0	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
60 R60	0	0	3	0	0	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
61 R61	0	0	3	0	0	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
62 R62	0	0	3	0	0	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
63 R63	0	0	3	0	0	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
64 R64	0	0	3	0	0	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
65 R65	0	0	0	0	0	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
66 R66	0	0	0	0	0	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
67 R67	0	0	0	0	0	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
68 R68	0	0	0	0	0	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
69 R69	0	0	0	2	2	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
70 R70	0	0	0	0	0	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
71 R71	0	0	0	0	0	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
72 R72	0	0	0	0	0	3	3	0	0	0	0	0	0	0	0	2	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
73 R73	0	0	0	0	0	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
74 R74	0	0	0	0	0	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
75 R75	0	0	0	0	0	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
76 R76	0	0	0	0	0	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
77 R77	0	0	0	0	0	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Appendix -F (I) UCINET results on Degree centrality of the Social Network of the innovation AutoCAD

		Degree	NrmDegree	Share
4	R4	28	36.842	0.064
6	R6	21	27.632	0.048
47	R47	19	25	0.044
2	R2	19	25	0.044
17	R17	18	23.684	0.041
46	R46	18	23.684	0.041
35	R35	10	13.158	0.023
15	R15	10	13.158	0.023
43	R43	10	13.158	0.023
14	R14	10	13.158	0.023
37	R37	10	13.158	0.023
38	R38	9	11.842	0.021
9	R9	8	10.526	0.018
10	R10	8	10.526	0.018
31	R31	7	9.211	0.016
58	R58	7	9.211	0.016
56	R56	7	9.211	0.016
57	R57	7	9.211	0.016
7	R7	6	7.895	0.014
28	R28	6	7.895	0.014
23	R23	6	7.895	0.014
26	R26	6	7.895	0.014
27	R27	6	7.895	0.014
24	R24	6	7.895	0.014
8	R8	6	7.895	0.014
44	R44	5	6.579	0.011
1	R1	5	6.579	0.011
45	R45	5	6.579	0.011
5	R5	5	6.579	0.011
40	R40	4	5.263	0.009
16	R16	4	5.263	0.009
3	R3	4	5.263	0.009
55	R55	4	5.263	0.009
25	R25	4	5.263	0.009
53	R53	4	5.263	0.009
22	R22	3	3.947	0.007
13	R13	3	3.947	0.007
30	R30	3	3.947	0.007
12	R12	3	3.947	0.007
32	R32	3	3.947	0.007
33	R33	3	3.947	0.007
11	R11	3	3.947	0.007
39	R39	3	3.947	0.007
21	R21	3	3.947	0.007

		Degree	NrmDegree	Share
41	R41	3	3.947	0.007
42	R42	3	3.947	0.007
29	R29	3	3.947	0.007
48	R48	3	3.947	0.007
49	R49	3	3.947	0.007
50	R50	3	3.947	0.007
51	R51	3	3.947	0.007
71	R71	3	3.947	0.007
34	R34	3	3.947	0.007
73	R73	3	3.947	0.007
36	R36	3	3.947	0.007
18	R18	3	3.947	0.007
19	R19	3	3.947	0.007
20	R20	3	3.947	0.007
59	R59	3	3.947	0.007
60	R60	3	3.947	0.007
61	R61	3	3.947	0.007
62	R62	3	3.947	0.007
63	R63	3	3.947	0.007
64	R64	3	3.947	0.007
65	R65	3	3.947	0.007
66	R66	3	3.947	0.007
67	R67	3	3.947	0.007
68	R68	3	3.947	0.007
69	R69	3	3.947	0.007
70	R70	3	3.947	0.007
75	R75	3	3.947	0.007
72	R72	3	3.947	0.007
77	R77	3	3.947	0.007
74	R74	3	3.947	0.007
76	R76	3	3.947	0.007
52	R52	2	2.632	0.005
54	R54	2	2.632	0.005

DESCRIPTIVE STATISTICS

		1 Degree	2 NrmDegree	3 Share
1	Mean	5.662	7.45	0.013
2	Std Dev	4.898	6.445	0.011
3	Sum	436	573.684	1
4	Variance	23.99	41.534	0
5	SSQ	4316	7472.299	0.023
6	MCSSQ	1847.221	3198.097	0.01
7	Euc Norm	65.696	86.442	0.151
8	Minimum	2	2.632	0.005
9	Maximum	28	36.842	0.064
10	N of Obs	77	77	77

Network Centralization = 30.18%

Blau Heterogeneity = 2.27%. Normalized (IQV) = 0.98%

Network Centralization = 30.18%
Blau Heterogeneity = 2.27%. Normalized (IQV) = 0.98%

Appendix -F (II): UCINET results of Closeness centrality of the Social Network for AutoCAD innovation

		1 inFarness	2 outFarness	3 inCloseness	4 outCloseness
4	R4	143	5329	53.147	1.426
17	R17	143	5326	53.147	1.427
6	R6	146	5329	52.055	1.426
46	R46	165	5326	46.061	1.427
2	R2	165	5325	46.061	1.427
47	R47	183	5324	41.53	1.427
7	R7	212	5325	35.849	1.427
8	R8	215	5325	35.349	1.427
15	R15	3755	5249	2.024	1.448
14	R14	3755	5251	2.024	1.447
10	R10	4872	5101	1.56	1.49
43	R43	5020	5250	1.514	1.448
35	R35	5095	5175	1.492	1.469
27	R27	5107	5254	1.488	1.447
26	R26	5107	5254	1.488	1.447
58	R58	5246	4956	1.449	1.533
56	R56	5246	4955	1.449	1.534
57	R57	5246	4954	1.449	1.534
25	R25	5259	5254	1.445	1.447
37	R37	5320	5101	1.429	1.49
24	R24	5328	5034	1.426	1.51
38	R38	5396	5028	1.408	1.512
9	R9	5397	5025	1.408	1.512
31	R31	5398	5250	1.408	1.448
5	R5	5476	4950	1.388	1.535
23	R23	5624	5025	1.351	1.512
44	R44	5624	4880	1.351	1.557
28	R28	5624	5175	1.351	1.469
45	R45	5624	4880	1.351	1.557
1	R1	5625	4878	1.351	1.558
55	R55	5701	4880	1.333	1.557
16	R16	5701	4807	1.333	1.581
40	R40	5776	4951	1.316	1.535
3	R3	5776	4735	1.316	1.605
53	R53	5776	4811	1.316	1.58
22	R22	5852	5101	1.299	1.49
13	R13	5852	5254	1.299	1.447
30	R30	5852	5249	1.299	1.448
12	R12	5852	5254	1.299	1.447
32	R32	5852	5251	1.299	1.447
33	R33	5852	5251	1.299	1.447
11	R11	5852	5025	1.299	1.512
39	R39	5852	5030	1.299	1.511
21	R21	5852	5251	1.299	1.447
41	R41	5852	4953	1.299	1.534
42	R42	5852	5254	1.299	1.447
29	R29	5852	5249	1.299	1.448
48	R48	5852	5103	1.299	1.489
49	R49	5852	5103	1.299	1.489
50	R50	5852	4808	1.299	1.581
51	R51	5852	4734	1.299	1.605
52	R52	5852	4886	1.299	1.555
34	R34	5852	5100	1.299	1.49
54	R54	5852	4887	1.299	1.555
36	R36	5852	5254	1.299	1.447
18	R18	5852	5030	1.299	1.511
19	R19	5852	5250	1.299	1.448
20	R20	5852	4805	1.299	1.582
59	R59	5852	4954	1.299	1.534
60	R60	5852	4954	1.299	1.534
61	R61	5852	4954	1.299	1.534
62	R62	5852	4953	1.299	1.534
63	R63	5852	4953	1.299	1.534
64	R64	5852	4953	1.299	1.534
65	R65	5852	4663	1.299	1.63
66	R66	5852	5103	1.299	1.489
67	R67	5852	4583	1.299	1.658
68	R68	5852	4953	1.299	1.534
69	R69	5852	4732	1.299	1.606
70	R70	5852	5103	1.299	1.489
71	R71	5852	5251	1.299	1.447
72	R72	5852	4881	1.299	1.557
73	R73	5852	5027	1.299	1.512
74	R74	5852	4508	1.299	1.686
75	R75	5852	5249	1.299	1.448
76	R76	5852	5251	1.299	1.447
77	R77	5852	5251	1.299	1.447

		1 inFarness	2 outFarness	3 inCloseness	4 outCloseness
1	Minimum	143	4508	1.299	1.426
2	Average	5065.325	5065.325	5.935	1.503
3	Maximum	5852	5329	53.147	1.686
4	Sum	390030	390030	456.962	115.711
5	Standard D	1712.16	197.964	13.617	0.06
6	Variance	2931493	39189.93	185.432	0.004
7	SSQ	2.2E+09	1.98E+09	16990.1	174.163
8	MCSSQ	2.26E+08	3017625	14278.23	0.278
9	Euclidean N	46918.59	44481.98	130.346	13.197
10	Observations	77	77	77	77
11	Missing	0	0	0	0

Appendix-F(III): UCINET results of Betweenness centrality of the Social Network for AutoCAD innovation

		1 Betweenness	2 nBetweenness
2	R2	131.429	2.306
17	R17	94.591	1.659
47	R47	91.307	1.602
4	R4	59.798	1.049
6	R6	50.701	0.889
15	R15	47.49	0.833
10	R10	33.444	0.587
46	R46	31.736	0.557
57	R57	31.017	0.544
43	R43	30.304	0.532
9	R9	28.417	0.499
35	R35	24.052	0.422
24	R24	23.67	0.415
37	R37	20.833	0.365
14	R14	20.323	0.357
5	R5	19.208	0.337
56	R56	18.367	0.322
23	R23	17.658	0.31
1	R1	17.5	0.307
58	R58	17.283	0.303
7	R7	13.827	0.243
31	R31	13.46	0.236
28	R28	11.023	0.193
3	R3	8.5	0.149
27	R27	8.081	0.142
26	R26	8.081	0.142
8	R8	7.91	0.139
40	R40	7.167	0.126
55	R55	4.267	0.075
45	R45	3.667	0.064
44	R44	3.667	0.064
25	R25	3.557	0.062
38	R38	3.5	0.061
53	R53	2.667	0.047
16	R16	1.5	0.026
22	R22	0	0
13	R13	0	0
30	R30	0	0
12	R12	0	0
32	R32	0	0
33	R33	0	0
11	R11	0	0
39	R39	0	0

		1 Betweenness	2 nBetweenness
21	R21	0	0
41	R41	0	0
42	R42	0	0
29	R29	0	0
48	R48	0	0
49	R49	0	0
50	R50	0	0
51	R51	0	0
52	R52	0	0
34	R34	0	0
54	R54	0	0
36	R36	0	0
18	R18	0	0
19	R19	0	0
20	R20	0	0
59	R59	0	0
60	R60	0	0
61	R61	0	0
62	R62	0	0
63	R63	0	0
64	R64	0	0
65	R65	0	0
66	R66	0	0
67	R67	0	0
68	R68	0	0
69	R69	0	0
70	R70	0	0
71	R71	0	0
72	R72	0	0
73	R73	0	0
74	R74	0	0
75	R75	0	0
76	R76	0	0
77	R77	0	0

DESCRIPTIVE STATISTICS FOR EACH MEASURE

		1 Betweenne	2 nBetweenness
1	Mean	11.818	0.207
2	Std Dev	23.22	0.407
3	Sum	910	15.965
4	Variance	539.189	0.166
5	SSQ	52272.13	16.089
6	MCSSQ	41517.58	12.779
7	Euc Norm	228.631	4.011
8	Minimum	0	0
9	Maximum	131.429	2.306
10	N of OBS	77	77

Network Centralization Index = 2.13%

Appendix - G (I): UCINET results on Actor degree density of the Social Network on the innovation of CostX

		R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20	R21	R22	R23	R24	R25	R26	R27	R28	R29	R30	R31	R32	R33	R34	R35	R36	R37
1	Observations	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76
2	Missing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	Minimum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	Maximum	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	Sum	0	0	0	43	0	32	0	0	0	0	0	0	0	31	14	0	31	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	Average	0	0	0	0.57	0	0.4	0	0	0	0	0	0	0	0.41	0.2	0	0.41	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	SSQ	0	0	0	43	0	32	0	0	0	0	0	0	0	31	14	0	31	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	Standard Deviation	0	0	0	0.5	0	0.5	0	0	0	0	0	0	0	0.49	0.4	0	0.49	0	0	0	0.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	Variance	0	0	0	0.25	0	0.2	0	0	0	0	0	0	0	0.24	0.2	0	0.24	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	MCSSQ	0	0	0	18.7	0	19	0	0	0	0	0	0	0	18.4	11	0	18.4	0	0	0	8.7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	Euclidean Norm	0	0	0	6.56	0	5.7	0	0	0	0	0	0	0	5.57	3.7	0	5.57	0	0	0	3.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

		R38	R39	R40	R41	R42	R43	R44	R45	R46	R47	R48	R49	R50	R51	R52	R53	R54	R55	R56	R57	R58	R59	R60	R61	R62	R63	R64	R65	R66	R67	R68	R69	R70	R71	R72	R73	R74	R75	R76	R77
1	Observations	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76
2	Missing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	Minimum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	Maximum	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	Sum	0	0	0	0	0	0	0	0	34	25	0	7	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	Average	0	0	0	0	0	0	0	0	0	0.3	0	0.1	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	SSQ	0	0	0	0	0	0	0	0	34	25	0	7	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	Standard Deviation	0	0	0	0	0	0	0	0	0	0.5	0	0.3	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	Variance	0	0	0	0	0	0	0	0	0	0.2	0	0.1	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	MCSSQ	0	0	0	0	0	0	0	0	19	17	0	6.4	3.8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	Euclidean Norm	0	0	0	0	0	0	0	0	6	5	0	2.6	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Appendix - G (II): UCINET results on reachabilityof the Social Network on the innovation of CostX

	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20	R21	R22	R23	R24	R25	R26	R27	R28	R29	R30	R31	R32	R33	R34	R35	R36	R37	R38	R39	R40	R41	R42	R43	R44	R45	R46	R47	R48	R49	R5(	R51	R52	R53	R54	R55	R56	R57	R58	R59	R60	R61	R62	R63	R64	R65	R66	R67	R68	R69	R70	R71	R72	R73	R74	R75	R76	R77
1 R1	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2 R2	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3 R3	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4 R4	0	0	0	0	0	1	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5 R5	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6 R6	0	0	0	1	0	0	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7 R7	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8 R8	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9 R9	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 R10	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 R11	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12 R12	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13 R13	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14 R14	0	0	0	1	0	1	0	0	0	0	0	0	0	0	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15 R15	0	0	0	1	0	1	0	0	0	0	0	0	0	1	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16 R16	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17 R17	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18 R18	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19 R19	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20 R20	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21 R21	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22 R22	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23 R23	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24 R24	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25 R25	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26 R26	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27 R27	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28 R28	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29 R29	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30 R30	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31 R31	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32 R32	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33 R33	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34 R34	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35 R35	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36 R36	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
37 R37	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38 R38	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39 R39	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40 R40	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
41 R41	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
42 R42	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
43 R43	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
44 R44	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
45 R45	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
46 R46	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
47 R47	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
48 R48	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
49 R49	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50 R50	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
51 R51	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
52 R52	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
53 R53	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
54 R54	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
55 R55	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
56 R56	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
57 R57	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
58 R58	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
59 R59	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
60 R60	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
61 R61	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
62 R62	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
63 R63	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
64 R64	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
65 R65	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
66 R66	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
67 R67	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
68 R68	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
69 R69	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
70 R70	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
71 R71	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
72 R72	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
73 R73	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
74 R74	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
75 R75	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
76 R76	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
77 R77	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Appendix - G (III): UCINET results on Point Connectivity of the Social Network on the innovation of CostX

	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20	R21	R22	R23	R24	R25	R26	R27	R28	R29	R30	R31	R32	R33	R34	R35	R36	R37	R38	R39	R40	R41	R42	R43	R44	R45	R46	R47	R48	R49	R50	R51	R52	R53	R54	R55	R56	R57	R58	R59	R60	R61	R62	R63	R64	R65	R66	R67	R68	R69	R70	R71	R72	R73	R74	R75	R76	R77
1 R1	0	0	0	3	0	3	0	0	0	0	0	0	0	1	1	0	3	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	2	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2 R2	0	0	0	3	0	3	0	0	0	0	0	0	0	1	1	0	3	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	2	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3 R3	0	0	0	3	0	3	0	0	0	0	0	0	0	2	2	0	3	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4 R4	0	0	0	0	0	3	0	0	0	0	0	0	0	1	1	0	3	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	2	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5 R5	0	0	0	3	0	3	0	0	0	0	0	0	0	2	2	0	3	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6 R6	0	0	0	3	0	0	0	0	0	0	0	0	0	1	1	0	3	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	2	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7 R7	0	0	0	3	0	3	0	0	0	0	0	0	0	1	1	0	3	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	2	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8 R8	0	0	0	3	0	3	0	0	0	0	0	0	0	1	1	0	3	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9 R9	0	0	0	3	0	3	0	0	0	0	0	0	0	1	1	0	3	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	2	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 R10	0	0	0	3	0	3	0	0	0	0	0	0	0	2	2	0	3	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 R11	0	0	0	3	0	3	0	0	0	0	0	0	0	1	1	0	3	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	2	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12 R12	0	0	0	3	0	3	0	0	0	0	0	0	0	1	1	0	3	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13 R13	0	0	0	3	0	3	0	0	0	0	0	0	0	1	1	0	3	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	2	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14 R14	0	0	0	3	0	3	0	0	0	0	0	0	0	0	2	0	3	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15 R15	0	0	0	2	0	2	0	0	0	0	0	0	0	3	0	0	2	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16 R16	0	0	0	3	0	3	0	0	0	0	0	0	0	1	1	0	3	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	2	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17 R17	0	0	0	3	0	3	0	0	0	0	0	0	0	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	2	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18 R18	0	0	0	3	0	3	0	0	0	0	0	0	0	2	2	0	3	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19 R19	0	0	0	3	0	3	0	0	0	0	0	0	0	1	1	0	3	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20 R20	0	0	0	3	0	3	0	0	0	0	0	0	0	2	2	0	3	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21 R21	0	0	0	3	0	3	0	0	0	0	0	0	0	2	2	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22 R22	0	0	0	3	0	3	0	0	0	0	0	0	0	1	1	0	3	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23 R23	0	0	0	3	0	3	0	0	0	0	0	0	0	1	1	0	3	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24 R24	0	0	0	3	0	3	0	0	0	0	0	0	0	1	1	0	3	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	2	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25 R25	0	0	0	3	0	3	0	0	0	0	0	0	0	1	1	0	3	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	2	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26 R26	0	0	0	3	0	3	0	0	0	0	0	0	0	1	1	0	3	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	2	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27 R27	0	0	0	3	0	3	0	0	0	0	0	0	0	1	1	0	3	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	2	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28 R28	0	0	0	3	0	3	0	0	0	0	0	0	0	2	2	0	3	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29 R29	0	0	0	3	0	3	0	0	0	0	0	0	0	1	1	0	3	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30 R30	0	0	0	3	0	3	0	0	0	0	0	0	0	2	2	0	3	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31 R31	0	0	0	3	0	3	0	0	0	0	0	0	0	1	1	0	3	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	2	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32 R32	0	0	0	3	0	3	0	0	0	0	0	0	0	3	3	0	3	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33 R33	0	0	0	3	0	3	0	0	0	0	0	0	0	2	2	0	3	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34 R34	0	0	0	3	0	3	0	0	0	0	0	0	0	1	1	0	3	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35 R35	0	0	0	3	0	3	0	0	0	0	0	0	0	1	1	0	3	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	2	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36 R36	0	0	0	3	0	3	0	0	0	0	0	0	0	1	1	0	3	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	2	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
37 R37	0	0	0	3	0	3	0	0	0	0	0	0	0	2	2	0	3	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38 R38	0	0	0	3	0	3	0	0	0	0	0	0	0	1	1	0	3	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	2	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39 R39	0	0	0	3	0	3	0	0	0	0	0	0	0	1	1	0	3	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	2	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40 R40	0	0	0	3	0	3	0	0	0	0	0	0	0	1	1	0	3	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
41 R41	0	0	0	3	0	3	0	0	0	0	0	0	0	2	2	0	3	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
42 R42	0	0	0	3	0	3	0	0	0	0	0	0	0	3	3	0	3	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
43 R43	0	0	0	3	0	3	0	0	0	0	0	0	0	1	1	0	3	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	2	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
44 R44	0	0	0	3	0	3	0	0	0	0	0	0	0	1	1	0	3	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
45 R45	0	0	0	3	0	3	0	0	0	0	0	0	0	1	1	0	3	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	2	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
46 R46	0	0	0	3	0	3	0	0	0	0	0	0	0	1	1	0	3	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
47 R47	0	0	0	3	0	3	0	0	0	0	0	0	0	2	2	0	3	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
48 R48	0	0	0	2	0	2	0	0	0	0	0	0	0	3	3	0	2	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
49 R49	0	0	0	2	0	2	0	0	0	0	0	0	0	3	3	0	2	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50 R50	0	0	0	2	0	2	0	0	0	0	0	0	0	3	3	0	2	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
51 R51	0	0	0	3	0	3	0	0	0	0	0	0	0	3	3	0	3	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
52 R52	0	0	0	3	0	3	0	0	0	0	0	0	0	2	2	0	3	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
53 R53	0	0	0	3	0	3	0	0	0	0	0	0	0	1	1	0	3	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	2	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
54 R54	0	0	0	3	0	3	0	0	0	0	0	0	0	2	2	0	3	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
55 R55	0	0	0	2	0	2	0	0	0	0	0	0	0	3	3	0	2	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
56 R56	0	0	0	3	0	3	0	0	0	0	0	0	0	3	3	0	3	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	0	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
57 R57	0	0	0	3	0	3	0	0	0	0	0	0	0	2	2	0	3	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
58 R58	0	0	0	3	0	3	0	0	0	0	0	0	0	3	3	0	3	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
59 R59	0	0	0	3	0	3	0	0	0	0	0	0	0	1	1	0	3	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
60 R60	0	0	0	3	0	3	0	0	0	0	0	0	0	3	3	0	3	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
61 R61	0	0	0	3	0	3	0	0	0	0	0	0	0	2	2	0	3	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
62 R62	0	0	0	3	0	3	0	0	0	0	0	0	0	2	2	0	3	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
63 R63	0	0	0	3	0	3	0	0	0	0	0	0	0	3	2	0	3	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	0	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
64 R64	0	0	0	3	0	3	0	0	0	0	0	0	0	2	2	0	3	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
65 R65	0	0	0	3	0	3	0	0	0	0	0	0	0	1	1	0	3	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	2	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
66 R66	0	0	0	3	0	3	0	0	0	0	0	0	0	3	2	0	3	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
67 R67	0	0	0	3	0	3	0	0	0	0	0	0	0	2	2	0	3	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
68 R68	0	0	0	3	0	3	0	0	0	0	0	0	0	3	3	0	3	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
69 R69	0	0	0	3	0	3	0	0	0	0	0	0	0	2	2	0	3	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
70 R70	0	0	0	3	0	3	0	0	0	0	0	0	0	2	2	0	3	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
71 R71	0	0	0	3	0	3	0	0	0	0	0	0	0	2	2	0	3	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
72 R72	0	0	0	3	0	3	0	0	0	0	0	0	0	3	3	0	3	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
73 R73	0	0	0	3	0	3	0	0	0	0	0	0	0	2	2	0	3	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
74 R74	0	0	0	3	0	3	0	0	0	0	0	0	0	1	1	0	3	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	2	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
75 R75	0	0	0	2	0	2	0	0	0	0	0	0	0	3	2	0	2	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
76 R76	0	0	0	3	0	3	0	0	0	0	0	0	0	3	2	0	3	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
77 R77	0	0	0	3	0	3	0	0	0	0	0	0	0	2	2	0	3	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Appendix -H (I) UCINET results on Degree centrality of the Social Network of the innovation CostX

		1 Degree	2 NrmDegree	3 Share
4	R4	44	57.895	0.099
46	R46	35	46.053	0.078
6	R6	33	43.421	0.074
14	R14	32	42.105	0.072
17	R17	32	42.105	0.072
47	R47	27	35.526	0.061
15	R15	15	19.737	0.034
21	R21	13	17.105	0.029
49	R49	8	10.526	0.018
50	R50	6	7.895	0.013
10	R10	3	3.947	0.007
3	R3	3	3.947	0.007
1	R1	3	3.947	0.007
5	R5	3	3.947	0.007
7	R7	3	3.947	0.007
16	R16	3	3.947	0.007
13	R13	3	3.947	0.007
18	R18	3	3.947	0.007
19	R19	3	3.947	0.007
20	R20	3	3.947	0.007
2	R2	3	3.947	0.007
22	R22	3	3.947	0.007
23	R23	3	3.947	0.007
24	R24	3	3.947	0.007
25	R25	3	3.947	0.007
26	R26	3	3.947	0.007
27	R27	3	3.947	0.007
28	R28	3	3.947	0.007
29	R29	3	3.947	0.007
30	R30	3	3.947	0.007
31	R31	3	3.947	0.007
32	R32	3	3.947	0.007
33	R33	3	3.947	0.007
34	R34	3	3.947	0.007
35	R35	3	3.947	0.007
36	R36	3	3.947	0.007
37	R37	3	3.947	0.007
38	R38	3	3.947	0.007
39	R39	3	3.947	0.007
40	R40	3	3.947	0.007
41	R41	3	3.947	0.007
42	R42	3	3.947	0.007
43	R43	3	3.947	0.007
44	R44	3	3.947	0.007
45	R45	3	3.947	0.007
8	R8	3	3.947	0.007
9	R9	3	3.947	0.007
48	R48	3	3.947	0.007
11	R11	3	3.947	0.007
12	R12	3	3.947	0.007
51	R51	3	3.947	0.007
52	R52	3	3.947	0.007
53	R53	3	3.947	0.007
54	R54	3	3.947	0.007
55	R55	3	3.947	0.007
56	R56	3	3.947	0.007
57	R57	3	3.947	0.007
58	R58	3	3.947	0.007
59	R59	3	3.947	0.007
60	R60	3	3.947	0.007
61	R61	3	3.947	0.007
62	R62	3	3.947	0.007
63	R63	3	3.947	0.007
64	R64	3	3.947	0.007
65	R65	3	3.947	0.007
66	R66	3	3.947	0.007
67	R67	3	3.947	0.007
68	R68	3	3.947	0.007
69	R69	3	3.947	0.007
70	R70	3	3.947	0.007
71	R71	3	3.947	0.007
72	R72	3	3.947	0.007
73	R73	3	3.947	0.007
74	R74	3	3.947	0.007
75	R75	3	3.947	0.007
76	R76	3	3.947	0.007
77	R77	3	3.947	0.007

DESCRIPTIVE STATISTICS

		1 Degree	2 NrmDegree	3 Share
1	Mean	5.792	7.621	0.013
2	Std Dev	8.483	11.161	0.019
3	Sum	446	586.842	1
4	Variance	71.957	124.579	0
5	SSQ	8124	14065.1	0.041
6	MCSSQ	5540.675	9592.582	0.028
7	Euc Norm	90.133	118.596	0.202
8	Minimum	3	3.947	0.007
9	Maximum	44	57.895	0.099
10	N of Obs	77	77	77

Network Centralization = 51.61%

Blau Heterogeneity = 4.08%. Normalized (IQV) = 2.82%

Appendix -H (II): UCINET results of Closeness centrality of the Social Network for CostX innovation

	1	2	3	4	
	inFarness	outFarness	inCloseness	outCloseness	
4	R4	115	5183	66.087	1.466
46	R46	119	5178	63.866	1.468
47	R47	127	5175	59.843	1.469
17	R17	129	5178	58.915	1.468
6	R6	130	5183	58.462	1.466
14	R14	144	5176	52.778	1.468
15	R15	173	5177	43.931	1.468
49	R49	207	5177	36.715	1.468
50	R50	229	5176	33.188	1.468
21	R21	277	5175	27.437	1.469
10	R10	5852	5102	1.299	1.49
3	R3	5852	5103	1.299	1.489
1	R1	5852	5108	1.299	1.488
5	R5	5852	5103	1.299	1.489
7	R7	5852	5108	1.299	1.488
16	R16	5852	5108	1.299	1.488
13	R13	5852	5108	1.299	1.488
18	R18	5852	5103	1.299	1.489
19	R19	5852	5103	1.299	1.489
20	R20	5852	5103	1.299	1.489
2	R2	5852	5108	1.299	1.488
22	R22	5852	5103	1.299	1.489
23	R23	5852	5103	1.299	1.489
24	R24	5852	5108	1.299	1.488
25	R25	5852	5108	1.299	1.488
26	R26	5852	5108	1.299	1.488
27	R27	5852	5108	1.299	1.488
28	R28	5852	5103	1.299	1.489
29	R29	5852	5103	1.299	1.489
30	R30	5852	5102	1.299	1.49
31	R31	5852	5108	1.299	1.488
32	R32	5852	5100	1.299	1.49
33	R33	5852	5103	1.299	1.489
34	R34	5852	5103	1.299	1.489
35	R35	5852	5108	1.299	1.488
36	R36	5852	5108	1.299	1.488
37	R37	5852	5103	1.299	1.489
38	R38	5852	5108	1.299	1.488
39	R39	5852	5108	1.299	1.488
40	R40	5852	5103	1.299	1.489
41	R41	5852	5103	1.299	1.489

	1	2	3	4	
	inFarness	outFarness	inCloseness	outCloseness	
42	R42	5852	5101	1.299	1.49
43	R43	5852	5108	1.299	1.488
44	R44	5852	5103	1.299	1.489
45	R45	5852	5108	1.299	1.488
8	R8	5852	5103	1.299	1.489
9	R9	5852	5108	1.299	1.488
48	R48	5852	5104	1.299	1.489
11	R11	5852	5108	1.299	1.488
12	R12	5852	5103	1.299	1.489
51	R51	5852	5100	1.299	1.49
52	R52	5852	5103	1.299	1.489
53	R53	5852	5108	1.299	1.488
54	R54	5852	5101	1.299	1.49
55	R55	5852	5101	1.299	1.49
56	R56	5852	5102	1.299	1.49
57	R57	5852	5103	1.299	1.489
58	R58	5852	5100	1.299	1.49
59	R59	5852	5103	1.299	1.489
60	R60	5852	5100	1.299	1.49
61	R61	5852	5103	1.299	1.489
62	R62	5852	5100	1.299	1.49
63	R63	5852	5100	1.299	1.49
64	R64	5852	5102	1.299	1.49
65	R65	5852	5108	1.299	1.488
66	R66	5852	5101	1.299	1.49
67	R67	5852	5100	1.299	1.49
68	R68	5852	5099	1.299	1.49
69	R69	5852	5102	1.299	1.49
70	R70	5852	5103	1.299	1.489
71	R71	5852	5100	1.299	1.49
72	R72	5852	5099	1.299	1.49
73	R73	5852	5101	1.299	1.49
74	R74	5852	5108	1.299	1.488
75	R75	5852	5101	1.299	1.49
76	R76	5852	5101	1.299	1.49
77	R77	5852	5103	1.299	1.489

	1	2	3	4	
	inFarness	outFarness	inCloseness	outCloseness	
1	Minimum	115	5099	1.299	1.466
2	Average	5113.429	5113.429	7.639	1.486
3	Maximum	5852	5183	66.087	1.49
4	Sum	393734	393734	588.232	114.446
5	Standard D	1911.838	25.05	17.076	0.007
6	Variance	3655125	627.492	291.597	0
7	SSQ	2.29E+09	2.01E+09	26946.72	170.108
8	MCSSQ	2.81E+08	48316.86	22452.98	0.004
9	Euclidean N	47903.81	44870.69	164.155	13.043
10	Observatio	77	77	77	77
11	Missing	0	0	0	0

Appendix-H(III): UCINET results of Betweenness centrality of the Social Network for CostX innovation

		1	2
		Betweenne	nBetweenness
47	R47	221.2	3.881
15	R15	128.45	2.254
14	R14	118.6	2.081
17	R17	100.533	1.764
46	R46	96.567	1.694
50	R50	71.567	1.256
4	R4	53.15	0.932
49	R49	43.867	0.77
6	R6	30.583	0.537
21	R21	25.483	0.447
10	R10	0	0
3	R3	0	0
1	R1	0	0
5	R5	0	0
7	R7	0	0
16	R16	0	0
13	R13	0	0
18	R18	0	0
19	R19	0	0
20	R20	0	0
2	R2	0	0
22	R22	0	0
23	R23	0	0
24	R24	0	0
25	R25	0	0
26	R26	0	0
27	R27	0	0
28	R28	0	0
29	R29	0	0
30	R30	0	0
31	R31	0	0
32	R32	0	0
33	R33	0	0
34	R34	0	0
35	R35	0	0
36	R36	0	0
37	R37	0	0
38	R38	0	0
39	R39	0	0
40	R40	0	0
41	R41	0	0
42	R42	0	0
43	R43	0	0
44	R44	0	0

		1	2
		Betweenne	nBetweenness
45	R45	0	0
8	R8	0	0
9	R9	0	0
48	R48	0	0
11	R11	0	0
12	R12	0	0
51	R51	0	0
52	R52	0	0
53	R53	0	0
54	R54	0	0
55	R55	0	0
56	R56	0	0
57	R57	0	0
58	R58	0	0
59	R59	0	0
60	R60	0	0
61	R61	0	0
62	R62	0	0
63	R63	0	0
64	R64	0	0
65	R65	0	0
66	R66	0	0
67	R67	0	0
68	R68	0	0
69	R69	0	0
70	R70	0	0
71	R71	0	0
72	R72	0	0
73	R73	0	0
74	R74	0	0
75	R75	0	0
76	R76	0	0
77	R77	0	0

DESCRIPTIVE STATISTICS FOR EACH MEASURE

		1	2
		Betweenn	nBetweenness
1	Mean	11.558	0.203
2	Std Dev	36.055	0.633
3	Sum	890	15.614
4	Variance	1299.943	0.4
5	SSQ	110382.6	33.974
6	MCSSQ	100095.6	30.808
7	Euc Norm	332.239	5.829
8	Minimum	0	0
9	Maximum	221.2	3.881
10	N of Obs	77	77

Network Centralization Index = 3.73%

Appendix - I (I): UCINET results on Actor degree density of the Social Network on the innovation of New Rules of Measurment

		R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20	R21	R22	R23	R24	R25	R26	R27	R28	R29
1	Mean	0.092	0.132	0	0.145	0.066	0.105	0.105	0.105	0.118	0.079	0	0.066	0.066	0.118	0.107	0.026	0.039	0.039	0.053	0.039	0.053	0.026	0.026	0.066	0	0.066	0.039	0.039	0.039
2	Std Dev	0.289	0.338	0	0.352	0.248	0.307	0.307	0.307	0.323	0.27	0	0.248	0.248	0.323	0.309	0.16	0.195	0.195	0.225	0.195	0.223	0.16	0.16	0.248	0	0.248	0.195	0.195	0.195
3	Sum	7	10	0	11	5	8	8	8	9	6	0	5	5	9	8	2	3	3	4	3	4	2	2	5	0	5	3	3	3
4	Variance	0.084	0.114	0	0.124	0.061	0.094	0.094	0.094	0.104	0.073	0	0.061	0.061	0.104	0.095	0.026	0.038	0.038	0.05	0.038	0.05	0.026	0.026	0.061	0	0.061	0.038	0.038	0.038
5	SSQ	7	10	0	11	5	8	8	8	9	6	0	5	5	9	8	2	3	3	4	3	4	2	2	5	0	5	3	3	3
6	MCSSQ	6.355	8.684	0	9.408	4.671	7.158	7.158	7.158	7.934	5.526	0	4.671	4.671	7.934	7.147	1.947	2.882	2.882	3.787	2.882	3.789	1.947	1.947	4.671	0	4.671	2.882	2.882	2.882
7	Euc Norm	2.646	3.162	0	3.317	2.236	2.828	2.828	2.828	3	2.449	0	2.236	2.236	3	2.828	1.414	1.732	1.732	2	1.732	2	1.414	1.414	2.236	0	2.236	1.732	1.732	1.732
8	Minimum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	Maximum	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1
10	N of Obs	76	76	76	76	76	76	76	76	76	76	76	76	76	76	75	76	76	76	75	76	76	76	76	76	76	76	76	76	76
11	N Missing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0

		R30	R31	R32	R33	R34	R35	R36	R37	R38	R39	R40	R41	R42	R43	R44	R45	R46	R47	R48	R49	R50	R51	R52	R53	R54	R55	R56	R57	R58
1	Mean	0.026	0.079	0	0.039	0.053	0.132	0.053	0.039	0.053	0.053	0.1	0.053	0.026	0.105	0.053	0.066	0.026	0.079	0.026	0.013	0.013	0	0	0	0	0	0.026	0.026	0.026
2	Std Dev	0.16	0.27	0	0.195	0.223	0.338	0.223	0.195	0.223	0.223	0.3	0.223	0.16	0.307	0.223	0.248	0.16	0.27	0.16	0.114	0.114	0	0	0	0	0	0.16	0.16	0.16
3	Sum	2	6	2	3	4	10	4	3	4	4	6	4	2	8	4	5	2	6	2	1	1	0	0	0	0	0	2	2	2
4	Variance	0.026	0.073	0	0.038	0.05	0.114	0.05	0.038	0.05	0.05	0.1	0.05	0.026	0.094	0.05	0.061	0.026	0.073	0.026	0.013	0.013	0	0	0	0	0	0.026	0.026	0.026
5	SSQ	2	6	2	3	4	10	4	3	4	4	6	4	2	8	4	5	2	6	2	1	1	0	0	0	0	0	2	2	2
6	MCSSQ	1.947	5.526	2	2.882	3.789	8.684	3.789	2.882	3.789	3.789	5.5	3.789	1.947	7.158	3.789	4.671	1.947	5.526	1.947	0.987	0.987	0	0	0	0	0	1.947	1.947	1.947
7	Euc Norm	1.414	2.449	1	1.732	2	3.162	2	1.732	2	2	2.4	2	1.414	2.828	2	2.236	1.414	2.449	1.414	1	1	0	0	0	0	0	1.414	1.414	1.414
8	Minimum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	Maximum	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	1	1	1
10	N of Obs	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76
11	N Missing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

		R59	R60	R61	R62	R63	R64	R65	R66	R67	R68	R69	R70	R71	R72	R73	R74	R75	R76	R77
1	Mean	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	Std Dev	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	Sum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	Variance	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	SSQ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	MCSSQ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	Euc Norm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	Minimum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	Maximum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	N of Obs	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76
11	N Missing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Appendix - I (II) UCINET results on Reachability of the Social Network on the innovation of New Rules of Measurement

	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20	R21	R22	R23	R24	R25	R26	R27	R28	R29	R30	R31	R32	R33	R34	R35	R36	R37	R38	R39	R40	R41	R42	R43	R44	R45	R46	R47	R48	R49	R50	R51	R52	R53	R54	R55	R56	R57	R58	R59	R60	R61	R62	R63	R64	R65	R66	R67	R68	R69	R70	R71	R72	R73	R74	R75	R76	R77
1 R1	0	1	0	1	0	1	1	1	1	1	0	1	1	1	1	0	1	1	1	1	1	0	0	1	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	1	1	0	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2 R2	1	0	0	1	0	1	1	1	1	1	0	1	1	1	1	0	1	1	1	1	1	0	0	1	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	1	1	0	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3 R3	1	1	0	1	0	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	0	0	1	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	1	1	0	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4 R4	1	1	0	0	0	1	1	1	1	1	0	1	1	1	1	0	1	1	1	1	1	0	0	1	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	1	1	0	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5 R5	1	1	0	1	0	1	1	1	1	1	0	1	1	1	1	0	1	1	1	1	1	1	0	1	0	1	0	1	0	0	0	0	0	0	1	0	0	0	1	1	1	0	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6 R6	1	1	0	1	0	0	1	1	1	1	0	1	1	1	1	0	1	1	1	1	1	0	0	1	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	1	1	0	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7 R7	1	1	0	1	0	1	1	1	1	1	0	1	1	1	1	0	1	1	1	1	1	0	0	1	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	1	1	0	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8 R8	1	1	0	1	0	1	1	0	1	1	0	1	1	1	1	0	1	1	1	1	1	0	0	1	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	1	1	0	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9 R9	1	1	0	1	0	1	1	1	0	1	0	1	1	1	1	0	1	1	1	1	1	0	0	1	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	1	1	0	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 R10	1	1	0	1	0	1	1	1	1	0	0	1	1	1	1	0	1	1	1	1	1	0	0	1	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	1	1	0	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 R11	1	1	0	1	0	1	1	1	1	1	0	1	1	1	1	0	1	1	1	1	1	0	0	1	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	1	1	0	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12 R12	1	1	0	1	0	1	1	1	1	1	0	0	1	1	1	0	1	1	1	1	1	0	0	1	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	1	1	0	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13 R13	1	1	0	1	0	1	1	1	1	1	0	1	0	1	1	0	1	1	1	1	1	0	0	1	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	1	1	0	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14 R14	1	1	0	1	0	1	1	1	1	1	0	1	1	0	1	0	1	1	1	1	1	0	0	1	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	1	1	0	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15 R15	1	1	0	1	0	1	1	1	1	1	0	1	1	1	0	0	1	1	1	1	1	0	0	1	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	1	1	0	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16 R16	1	1	0	1	0	1	1	1	1	1	0	1	1	1	1	0	1	1	1	1	1	0	0	1	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	1	1	0	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17 R17	1	1	0	1	0	1	1	1	1	1	0	1	1	1	1	0	0	1	1	1	1	0	0	1	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	1	1	0	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18 R18	1	1	0	1	0	1	1	1	1	1	0	1	1	1	1	0	1	0	1	1	1	0	0	1	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	1	1	0	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19 R19	1	1	0	1	0	1	1	1	1	1	0	1	1	1	1	0	1	1	0	1	1	0	0	1	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	1	1	0	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20 R20	1	1	0	1	0	1	1	1	1	1	0	1	1	1	1	0	1	1	1	0	1	0	0	1	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	1	1	0	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21 R21	1	1	0	1	0	1	1	1	1	1	0	1	1	1	1	0	1	1	1	1	0	0	0	1	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	1	1	0	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22 R22	1	1	0	1	0	1	1	1	1	1	0	1	1	1	1	0	1	1	1	1	1	0	0	1	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	1	1	0	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23 R23	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	0	1	1	1	1	1	1	0	1	0	1	1	1	1	1	1	0	1	1	1	1	0	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24 R24	1	1	0	1	0	1	1	1	1	1	0	1	1	1	1	0	1	1	1	1	1	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	1	1	0	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25 R25	1	1	0	1	0	1	1	1	1	1	0	1	1	1	1	0	1	1	1	1	1	0	0	1	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	1	1	0	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26 R26	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	0	1	1	1	1	1	1	0	1	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	1	1	0	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27 R27	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	0	1	1	1	1	1	1	0	1	0	1	0	1	0	0	1	0	0	0	1	0	0	0	1	1	1	0	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28 R28	1	1	0	1	0	1	1	1	1	1	0	1	1	1	1	0	1	1	1	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	1	0	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29 R29	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	0	1	1	1	1	1	1	1	1	0	1	1	1	0	1	1	0	1	1	1	1	0	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30 R30	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	0	1	1	1	1	1	1	1	1	0	1	1	1	1	0	1	0	1	1	1	1	0	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31 R31	1	1	0	1	0	1	1	1	1	1	0	1	1	1	1	0	1	1	1	1	1	0	0	1	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	1	1	0	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32 R32	1	1	0	1	0	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	0	0	1	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	1	1	0	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33 R33	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	0	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	0	0	1	1	1	0	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34 R34	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	0	1	1	1	1	1	1	0	1	0	1	0	1	0	0	0	0	0	0	1	0	0	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35 R35	1	1	0	1	0	1	1	1	1	1	0	1	1	1	1	0	1	1	1	1	1	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	1	1	0	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36 R36	1	1	0	1	0	1	1	1	1	1	0	1	1	1	1	0	1	1	1	1	1	0	0	1	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	1	1	0	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
37 R37	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	0	1	1	1	1	1	1	0	1	0	1	0	1	0	0	0	0	0	0	1	0	0	0	1	1	1	0	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38 R38	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	0	1	1	1	1	1	1	0	1	0	1	0	1	0	0	0	0	0	0	1	0	1	0	1	1	1	0	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39 R39	1	1	0	1	0	1	1	1	1	1	0	1	1	1	1	0	1	1	1	1	1	0	0	1	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	1	1	0	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40 R40	1	1	0	1	0	1	1	1	1	1	0	1	1	1	1	0	1	1	1	1	1	0	0	1	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	0	1	0	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
41 R41	1	1	0	1	0	1	1	1	1	1	0	1	1	1	1	0	1	1	1	1	1	0	0	1	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	1	0	0	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
42 R42	1	1	0	1	0	1	1	1	1	1	0	1	1	1	1	0	1	1	1	1	1	0	0	1	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	1	1	0	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
43 R43	1	1	0	1	0	1	1	1	1	1	0	1	1	1	1	0	1	1	1	1	1	0	0	1	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	1	1	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
44 R44	1	1	0	1	0	1	1	1	1	1	0	1	1	1	1	0	1	1	1	1	1	0	0	1	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	1	1	0	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
45 R45	1	1	0	1	0	1	1	1	1	1	0	1	1	1	1	0	1	1	1	1	1	0	0	1	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	1	1	0	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
46 R46	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	0	1	1	1	1	1	1	0	1	0	1	0	1	0	0	0	0	0	0	1	0	0	0	1	1	1	0	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
47 R47	1	1	0	1	0	1	1	1	1	1	0	1	1	1	1	0	1	1	1	1	1	0	0	1	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	1	1	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
48 R48	1	1	0	1	0	1	1	1	1	1	0	1	1	1	1	0	1	1	1	1	1	0	0	1	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	1	1	0	1	1	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
49 R49	1	1	0	1	0	1	1	1	1	1	0	1	1	1	1	0	1	1	1	1	1	0	0	1	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	1	1	0	1	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50 R50	1	1	0	1	0	1	1	1	1	1	0	1	1	1	1	0	1	1	1	1	1	0	0	1	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	1	1	0	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
51 R51	1	1	0	1	0	1	1	1	1	1	0	1	1	1	1	0	1	1	1	1	1	0	0	1	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	1	1	0	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
52 R52	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	0	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	0	1	1	1	1	0	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
53 R53	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	0	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	0	1	1	1	1	0	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
54 R54	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	0	1	0	1	1	1	0	0	1	1	0	0	1	0	0	0	1	1	1	0	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
55 R55	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	0	1	1	1	1	1	1	0	1	0	1	0	1	0	0	0	0	0	0	1	0	0	0	1	1	1	0	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
56 R56	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	0	1	1	1	1	1	1	0	1	0	1	0	1	0	0	0	0	0	1	1	0	0	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
57 R57	1	1	0	1	0	1	1	1	1	1	0	1	1	1	1	0	1	1	1	1	1	0	0	1	0	0	0	1	0	0	0	0	0	0	1	1	0	0	1	1	1	0	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
58 R58	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	0	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	0	1	1	1	1	0	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
59 R59	1	1	0	1	0	1	1	1	1	1	0	1	1	1	1	0	1	1	1	1	1	0	0	1	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	1	1	0	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
60 R60	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	0	1	1	1	1	1	1	0	1	0	1	0	1	0	0	1	0	0	0	1	0	0	0	1	1	1	0	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
61 R61	1	1	0	1	0	1	1	1	1	1	0	1	1	1	1	0	1	1	1	1	1	0	0	1	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	1	1	0	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
62 R62	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	0	1	1	1	1	1	1	0	1	0	1	0	1	0	0	0	0	0	0	1	1	1	1	1	1	1	0	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
63 R63	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	0	1	1	1	1	1	1	0	1	0	1	0	1	0	0	0	0	0	0	1	0	1	1	1	1	1	0	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
64 R64	1	1	0	1	0	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	0	0	1	0	0	0	1	0	0	0	1	0	0	1	0	0	0	1	1	1	0	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
65 R65	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	0	1	1	1	1	1	1	0	1	0	1	1	1	0	0	1	0	0	0	1	0	1	0	1	1	1	0	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
66 R66	1	1	0	1	0	1	1	1	1	1	0	1	1	1	1	0	1	1	1	1	1	0	0	1	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	1	1	0	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
67 R67	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	0	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	0	1	1	1	1	0	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
68 R68	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	0	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	0	1	1	1	1	0	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
69 R69	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	0	1	1	1	1	1	1	0	1	0	1	0	1	0	0	0	0	0	0	1	0	0	0	1	1	1	0	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
70 R70	1	1	0	1	0	1	1	1	1	1	0	1	1	1	1	0	1	1	1	1	1	0	0	1	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	1	1	0	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
71 R71	1	1	0	1	0	1	1	1	1	1	0	1	1	1	1	0	1	1	1	1	1	0	0	1	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	1	1	0	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
72 R72	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	0	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	0	1	1	1	1	0	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
73 R73	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	0	1	1	1	1	1	1	0	1	0	1	0	1	0	0	0	0	0	0	1	1	1	1	1	1	1	0	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
74 R74	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	0	1	1	1	1	1	1	0	1	0	1	0	1	0	0	0	0	0	0	1	0	0	0	1	1	1	0	1	1	1	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
75 R75	1	1	0	1	0	1	1	1	1	1	0	1	1	1	1	0	1	1	1	1	1	0	0	1	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	1	1	0	1	1	1	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
76 R76	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	0	1	1	1	1	1	1	0	1	0	1	0	1	0	0	0	0	0	0	1	0	1	1	1	1	1	0	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
77 R77	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	0	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	0	1	1	1	1	0	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Appendix - I(III) UCINET results on Point Connectivity of the Social Network on the innovation of New Rules of Measurment

	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20	R21	R22	R23	R24	R25	R26	R27	R28	R29	R30	R31	R32	R33	R34	R35	R36	R37	R38	R39	R40
1 R1	0	3	0	3	0	3	3	3	3	2	0	1	1	2	2	0	2	1	2	2	2	0	0	2	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	2
2 R2	3	0	0	3	0	3	3	3	3	2	0	1	1	2	2	0	2	1	2	2	2	0	0	2	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	2
3 R3	3	3	0	3	0	3	3	3	3	2	0	1	1	2	2	1	2	1	2	2	2	0	0	2	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	2
4 R4	3	3	0	0	0	3	3	3	3	2	0	1	1	2	2	0	2	1	2	2	2	0	0	2	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	2
5 R5	3	3	0	3	0	3	3	3	3	2	0	2	1	2	2	0	2	1	2	2	2	1	0	3	0	1	0	1	0	0	0	0	0	0	1	0	0	0	1	2
6 R6	2	2	0	3	0	0	3	3	2	2	0	1	1	2	2	0	2	1	2	2	2	0	0	2	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	2
7 R7	2	2	0	2	0	2	1	2	2	2	0	1	1	2	2	0	2	1	2	2	2	0	0	2	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	2
8 R8	2	2	0	3	0	3	3	0	2	2	0	1	1	2	2	0	2	1	2	2	2	0	0	2	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	2
9 R9	2	2	0	2	0	2	2	2	0	2	0	1	1	2	2	0	2	1	2	2	2	0	0	2	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	2
10 R10	3	3	0	3	0	3	3	3	3	0	0	1	1	2	2	0	2	1	3	2	2	0	0	2	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	2
11 R11	3	3	0	3	0	3	3	3	3	2	0	1	1	2	2	0	2	1	2	2	2	0	0	2	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	2
12 R12	3	3	0	3	0	3	3	3	3	2	0	0	1	2	2	0	2	1	2	2	2	0	0	2	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	2
13 R13	3	3	0	3	0	3	3	3	3	2	0	1	0	2	2	0	2	1	2	2	2	0	0	2	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	2
14 R14	2	2	0	2	0	2	2	2	2	2	0	1	1	0	3	0	2	1	2	2	3	0	0	2	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	2
15 R15	2	2	0	2	0	2	2	2	2	2	0	1	1	3	0	0	2	1	2	2	3	0	0	2	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	2
16 R16	3	3	0	3	0	3	3	3	3	2	0	1	1	2	2	0	2	1	2	2	2	0	0	2	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	2
17 R17	3	3	0	3	0	3	3	3	3	2	0	1	1	2	2	0	0	1	2	2	2	0	0	2	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	2
18 R18	3	3	0	3	0	3	3	3	3	2	0	1	1	2	2	0	2	0	3	2	2	0	0	2	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	2
19 R19	3	3	0	3	0	3	3	3	3	2	0	1	1	2	2	0	2	1	0	2	2	0	0	2	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	2
20 R20	3	3	0	3	0	3	3	3	3	2	0	1	1	2	2	0	2	1	2	0	2	0	0	2	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	2
21 R21	2	2	0	2	0	2	2	2	2	2	0	1	1	3	3	0	2	1	2	2	0	0	0	2	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	2
22 R22	3	3	0	3	0	3	3	3	3	2	0	2	1	2	2	0	2	1	2	2	2	0	0	2	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	2
23 R23	3	3	0	3	1	3	3	3	3	3	0	3	2	2	2	0	3	1	2	2	2	2	0	3	0	1	1	2	1	2	2	0	1	1	3	1	0	0	2	3
24 R24	2	2	0	3	0	3	3	3	2	2	0	1	1	2	2	0	2	1	2	2	2	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	2
25 R25	2	2	0	3	0	3	3	3	2	2	0	1	1	2	2	0	2	1	2	2	2	0	0	2	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	2
26 R26	3	3	0	3	1	3	3	3	3	2	0	2	1	2	2	0	2	1	2	2	2	1	0	3	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	2
27 R27	3	3	0	3	1	3	3	3	3	2	0	2	1	2	2	0	2	1	2	2	2	1	0	3	0	1	0	1	0	0	1	0	0	0	3	0	0	0	2	3
28 R28	3	3	0	3	0	3	3	3	3	2	0	1	1	2	2	0	2	1	2	2	2	0	0	2	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	2
29 R29	3	3	0	3	1	3	3	3	3	3	0	3	2	2	2	0	3	1	2	2	2	2	1	3	0	1	1	2	0	1	2	0	1	1	3	1	0	0	2	3
30 R30	3	3	0	3	1	3	3	3	3	3	0	3	3	2	2	0	3	1	2	2	2	2	1	3	0	2	1	2	1	0	1	0	1	2	3	1	0	0	3	3
31 R31	3	3	0	3	0	3	3	3	3	2	0	1	1	2	2	0	2	1	2	2	2	0	0	2	0	0	0	1	0	0	0	0	0	0	2	0	0	0	1	2
32 R32	3	3	0	3	0	3	3	3	3	2	0	1	1	3	3	1	2	1	2	2	3	0	0	2	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	2
33 R33	3	3	0	3	1	3	3	3	3	3	0	3	3	2	2	0	3	1	2	2	2	2	1	3	0	2	1	2	1	1	2	0	0	2	3	1	0	0	3	3
34 R34	3	3	0	3	1	3	3	3	3	3	0	3	2	2	2	0	2	1	2	2	2	1	0	3	0	1	0	1	0	0	0	0	0	0	3	0	0	0	2	3
35 R35	3	3	0	3	0	3	3	3	3	2	0	1	1	2	2	0	2	1	2	2	2	0	0	2	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	3
36 R36	3	3	0	3	0	3	3	3	3	2	0	1	2	2	2	0	3	1	2	2	2	0	0	2	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	2
37 R37	3	3	0	3	1	3	3	3	3	2	0	2	1	3	3	0	2	1	2	2	3	1	0	3	0	1	0	1	0	0	0	0	0	0	1	0	0	0	1	2
38 R38	3	3	0	3	2	3	3	3	3	2	0	2	1	3	3	0	2	1	2	2	3	1	0	3	0	1	0	1	0	0	0	0	0	0	2	0	1	0	1	2
39 R39	3	3	0	3	0	3	3	3	3	2	0	1	1	2	2	0	2	1	2	2	2	0	0	2	0	0	0	1	0	0	0	0	0	0	3	0	0	0	0	3
40 R40	1	1	0	1	0	1	1	1	3	1	0	1	1	1	1	0	1	1	1	1	1	0	0	1	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	0
41 R41	3	3	0	3	0	3	3	3	3	2	0	1	1	2	2	0	2	1	2	2	2	0	0	2	0	0	0	1	0	0	0	0	0	0	2	0	0	0	1	3
42 R42	3	3	0	3	0	3	3	3	3	3	0	2	2	2	2	0	2	1	2	2	2	0	0	2	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	2
43 R43	3	3	0	3	0	3	3	3	3	2	0	1	1	2	2	0	2	1	2	2	2	0	0	2	0	0	0	1	0	0	0	0	0	0	2	0	0	0	1	2
44 R44	1	1	0	1	0	1	1	1	3	1	0	1	1	1	1	0	1	1	1	1	1	0	0	1	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	3
45 R45	1	1	0	1	0	1	1	1	3	1	0	1	1	1	1	0	1	1	1	1	1	0	0	1	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	3
46 R46	3	3	0	3	1	3	3	3	3	2	0	2	1	2	2	0	2	1	2	2	2	1	0	3	0	1	0	1	0	0	0	0	0	0	2	0	0	0	2	3
47 R47	2	2	0	2	0	2	2	2	2	2	0	1	1	3	3	0	2	1	2	2	3	0	0	2	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	2
48 R48	2	2	0	2	0	2	2	2	2	2	0	1	1	3	3	0	2	1	2	2	3	0	0	2	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	2
49 R49	2	2	0	2	0	2	2	2	2	2	0	1	1	3	3	0	2	1	2	2	3	0	0	2	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	2
50 R50	1	1	0	1	0	1	1	1	3	1	0	1	1	1	1	0	1	1	1	1	1	0	0	1	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	3
51 R51	2	2	0	2	0	2	2	2	2	2	0	1	1	3	3	0	2	1	2	2	3	0	0	2	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	2
52 R52	3	3	0	3	1	3	3	3	3	3	0	3	3	2	2	0	3	1	2	2	2	2	1	3	0	2	1	2	1	1	1	0	1	2	3	2	0	0	3	3
53 R53	3	3	0	3	1	3	3	3	3	3	0	3	3	2	2	0	3	1	2	2	2	2	1	3	0	2	1	2	1	1	1	0	1	2	3	2	0	0	3	3
54 R54	3	3	0	3	1	3	3	3	3	2	0	2	1	3	3	1	2	1	2	2	3	1	0	3	0	1	1	1	0	0	2	1	0	0	3	0	0	0	2	3
55 R55	3	3	0	3	1	3	3	3	3	2	0	2	1	2	2	0	2	1	2	2	2	1	0	3	0	1	0	2	0	0	0	0	0	0	2	0	0	0	1	2
56 R56	3	3	0	3	1	3	3	3	3	3	0	2	2	2	2	0	2	1	2	2	2	1	0	3	0	1	0	1	0	0	0	0	0	1	2	0	0	0	2	3
57 R57	3	3	0	3	0	3	3	3	3	2	0	1	3	2	2	0	3	1	2	2	2	0	0	2	0	0	0	1	0	0	0	0	0	0	1	1	0	0	1	2
58 R58	3	3	0	3	1	3	3	3	3	3	0	2	2	2	2	0	3	1	2	2	2	1	1	3	0	1	1	2	1	1	1	0	1	1	2	1	0	0	2	3
59 R59	3	3	0	3	0	3	3	3	3	2	0	2	1	2	2	0	2	2	3	2	2	0	0	2	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	2
60 R60	3	3	0	3	1	3	3	3	3	2	0	2	1	2	2	0	2	1	2	2	2	1	0	3	0	1	0	1	0	0	1	0	0	0	3	0	0	0	1	2
61 R61	3	3	0	3	0	3	3	3	3	2	0	1	1	2	2	0	2	1	2	2	2	0	0	2	0	0	0	1	0	0	0	0	0	0	3	0	0	0	1	3
62 R62	3	3	0	3	2	3	3	3	3	2	0	2	2	3	3	0	3	1	2	2	3	1	0	3	0	1	0	1	0	0	0	0	0	0	2	1	2	1	1	2
63 R63	3	3	0	3	1	3	3	3	3	2	0	2	1	3	3	0	2	1	2	2	3	1	0	3	0	1	0	1	0	0	0	0	0	0	3	0	1	1	2	3
64 R64	3	3	0	3	0	3	3	3	3	2	0	1	1	3	3	1	2	1	2	2	3	0	0	2	0	0	0	1	0	0	0	1	0	0	3	0	0	0	1	2
65 R65	3	3	0	3	2	3	3	3	3	2	0	2	1	3	3	0	2	1	2	2	3	1	0	3	0	2	1	1	0	0	2	0	0	0	3	0	1	0	2	3
66 R66	3	3	0	3	0	3	3	3	3	3	0	1	1	3	3	0	2	1	2	2	3	0	0	2	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	2
67 R67	3	3	0	3	2	3	3	3	3	3	0	3	2	2	2	0	3	1	2	2	2	2	1	3	0	2	1	2	1	1	1	0	1	1	2	1	0	0	2	3
68 R68	3	3	0	3	1	3	3	3	3	3	0	3	3	2	2	0	3	1	2	2	2	2	1	3	0	2	1	2	1	1	1	0	1	2	3	1	0	0	3	3
69 R69	3	3	0	3	1	3	3	3	3	3	0	2	1	2	2	0	2	1	2	2	2	1	0	3	0	1	0	1	0	0	0	0	0	0	1	0	0	0	1	2
70 R70	3	3	0	3	0	3	3	3	3	2	0	1	2	3	3	0	2	1	2	2	3	0	0	2	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	2
71 R71	3	3	0	3	0	3	3	3	3	2	0	1	1	2	2	0	2	2	3	3	2	0	0	3	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	2
72 R72	3	3	0	3	1	3	3	3	3	3	0	2	2	2	2	0	3	1	2	2	2	1	1	3	0	1	1	2	1	1	2	0	1	1	3	1	0	0	2	3
73 R73	3	3	0	3	1	3	3	3	3	2	0	2	2	3	3	0	3	1	2	2	3	1	0	3	0	1	0	1	0	0	0	0	0	0	3	1	1	1	1	3
74 R74	3	3	0	3	1	3	3	3	3	2	0	2	1	2	2	0	2	1	2	2	2	1	0	3	0	1	0	1	0	0	0	0	0	0	3	0	0	0	2	3
75 R75	2	2	0	2	0	2	2	2	3	2	0	1	1	2	2	0	2	1	2	2	2	0	0	2	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	3
76 R76	2	2	0	2	1	2	2	2	3	2	0	2	1	2	2	0	2	1	2	2	2	1	0	2	0	1	0	1	0	0	0	0	0	0	2	0	1	1	1	3
77 R77	3	3	0	3	1	3	3	3	3	3	0	3	2	2	2	0	3	1	2	2	2	1	1	3	0	1	1	2	1	1	1	0	1	1	3	1	0	0	2	3

	R41	R42	R43	R44	R45	R46	R47	R48	R49	R50	R51	R52	R53	R54	R55	R56	R57	R58	R59	R60	R61	R62	R63	R64	R65	R66	R67	R68	R69	R70	R71	R72	R73	R74	R75	R76	R77
1 R1	1	0	1	1	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2 R2	1	0	1	1	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3 R3	1	0	1	1	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4 R4	1	0	1	1	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5 R5	1	0	1	1	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6 R6	1	0	1	1	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7 R7	1	0	1	1	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8 R8	1	0	1	1	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9 R9	1	0	1	1	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10 R10	1	0	1	1	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11 R11	1	0	1	1	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12 R12	1	0	1	1	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13 R13	1	0	1	1	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14 R14	1	0	1	1	1	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15 R15	1	0	1	1	1	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16 R16	1	0	1	1	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17 R17	1	0	1	1	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18 R18	1	0	1	1	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19 R19	1	0	1	1	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20 R20	1	0	1	1	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21 R21	1	0	1	1	1	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22 R22	1	0	1	1	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23 R23	2	1	3	1	1	1	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24 R24	1	0	1	1	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25 R25	1	0	1	1	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26 R26	1	0	1	1	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27 R27	1	0	3	1	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28 R28	1	0	1	1	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29 R29	2	1	3	1	1	1	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30 R30	2	1	3	1	1	1	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31 R31	1	0	2	1	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32 R32	1	0	1	1	1	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33 R33	2	1	3	1	1	1	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34 R34	2	1	3	1	1	1	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35 R35	1	0	2	1	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36 R36	1	0	1	1	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
37 R37	1	0	1	1	1	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38 R38	1	0	1	1	1	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39 R39	1	0	3	1	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40 R40	1	0	1	2	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
41 R41	0	0	2	1	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
42 R42	1	0	1	1	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
43 R43	1	0	0	1	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
44 R44	1	0	1	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
45 R45	1	0	1	2	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
46 R46	1	0	2	1	1	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
47 R47	1	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
48 R48	1	0	1	1	1	0	3	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
49 R49	1	0	1	1	1	0	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50 R50	1	0	1	3	3	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
51 R51	1	0	1	1	1	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
52 R52	2	1	3	1	1	1	3	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
53 R53	2	1	3	1	1	1	3	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
54 R54	1	0	3	1	1	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
55 R55	1	0	1	1	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
56 R56	2	1	2	1	1	1	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
57 R57	1	0	1	1	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
58 R58	2	1	2	1	1	1	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
59 R59	1	0	1	1	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
60 R60	1	0	2	1	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
61 R61	2	0	3	1	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
62 R62	1	0	1	1	1	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
63 R63	1	0	3	1	1	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
64 R64	1	0	2	1	1	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
65 R65	1	0	3	1	1	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
66 R66	1	0	1	1	1	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
67 R67	2	1	2	1	1	1	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
68 R68	2	2	3	1	1	1	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
69 R69	1	0	1	1	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
70 R70	1	0	1	1	1	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
71 R71	1	0	1	1	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
72 R72	2	1	3	1	1	1	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
73 R73	2	0	2	1	1	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
74 R74	1	0	3	2	2	1	3	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
75 R75	1	0	1	3	3	0	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
76 R76	1	0	1	2	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
77 R77	2	1	2	1	1	1	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Appendix -J (I) UCINET results on Degree centrality of the Social Network of the innovation AutoCAD

		1 Degree	2 NrmDegree	3 Share
4	R4	12	15.789	0.029
9	R9	11	14.474	0.026
35	R35	11	14.474	0.026
2	R2	11	14.474	0.026
43	R43	10	13.158	0.024
8	R8	10	13.158	0.024
31	R31	9	11.842	0.022
14	R14	9	11.842	0.022
1	R1	9	11.842	0.022
7	R7	9	11.842	0.022
15	R15	8	10.526	0.019
6	R6	8	10.526	0.019
12	R12	8	10.526	0.019
10	R10	8	10.526	0.019
24	R24	8	10.526	0.019
38	R38	7	9.211	0.017
36	R36	7	9.211	0.017
13	R13	7	9.211	0.017
34	R34	7	9.211	0.017
41	R41	7	9.211	0.017
26	R26	7	9.211	0.017
5	R5	7	9.211	0.017
39	R39	6	7.895	0.014
27	R27	6	7.895	0.014
40	R40	6	7.895	0.014
29	R29	6	7.895	0.014
19	R19	6	7.895	0.014
28	R28	6	7.895	0.014
33	R33	6	7.895	0.014
18	R18	6	7.895	0.014
37	R37	6	7.895	0.014
45	R45	6	7.895	0.014
47	R47	6	7.895	0.014
23	R23	5	6.579	0.012
22	R22	5	6.579	0.012
32	R32	5	6.579	0.012
16	R16	5	6.579	0.012
58	R58	5	6.579	0.012
57	R57	5	6.579	0.012
56	R56	5	6.579	0.012
17	R17	5	6.579	0.012
42	R42	5	6.579	0.012
44	R44	5	6.579	0.012
46	R46	5	6.579	0.012
30	R30	5	6.579	0.012
21	R21	4	5.263	0.01
50	R50	4	5.263	0.01
48	R48	4	5.263	0.01
20	R20	4	5.263	0.01
3	R3	3	3.947	0.007
51	R51	3	3.947	0.007
25	R25	3	3.947	0.007
53	R53	3	3.947	0.007
54	R54	3	3.947	0.007
55	R55	3	3.947	0.007
52	R52	3	3.947	0.007
11	R11	3	3.947	0.007
49	R49	3	3.947	0.007
59	R59	3	3.947	0.007
60	R60	3	3.947	0.007
61	R61	3	3.947	0.007
62	R62	3	3.947	0.007
63	R63	3	3.947	0.007
64	R64	3	3.947	0.007
65	R65	3	3.947	0.007
66	R66	3	3.947	0.007
67	R67	3	3.947	0.007
68	R68	3	3.947	0.007
69	R69	3	3.947	0.007
70	R70	3	3.947	0.007
71	R71	3	3.947	0.007
72	R72	3	3.947	0.007
73	R73	3	3.947	0.007
74	R74	3	3.947	0.007
75	R75	3	3.947	0.007
76	R76	3	3.947	0.007
77	R77	3	3.947	0.007

DESCRIPTIVE STATISTICS

		1 Degree	2 NrmDegree	3 Share
1	Mean	5.403	7.109	0.013
2	Std Dev	2.44	3.211	0.006
3	Sum	416	547.368	1
4	Variance	5.955	10.31	0
5	SSQ	2706	4684.903	0.016
6	MCSSQ	458.519	793.836	0.003
7	Euc Norm	52.019	68.446	0.125
8	Minimum	3	3.947	0.007
9	Maximum	12	15.789	0.029
10	N of Obs	77	77	77

Network Centralization = 8.91%

Blau Heterogeneity = 1.56%. Normalized (IQV) = 0.27%

Appendix -J (II): UCINET results of Closeness centrality of the Social Network for New Rules of Measurment

		1 inFarness	2 outFarness	3 inCloseness	4 outCloseness
4	R4	180	3927	42.222	1.935
8	R8	193	3934	39.378	1.932
2	R2	196	3936	38.776	1.931
35	R35	204	3950	37.255	1.924
7	R7	205	3935	37.073	1.931
6	R6	208	3944	36.538	1.927
10	R10	229	3927	33.188	1.935
9	R9	229	3936	33.188	1.931
40	R40	229	3957	33.188	1.921
1	R1	241	3933	31.535	1.932
43	R43	247	3941	30.769	1.928
13	R13	257	3938	29.572	1.93
39	R39	258	3954	29.457	1.922
19	R19	278	3926	27.338	1.936
17	R17	281	3923	27.046	1.937
24	R24	281	3949	27.046	1.925
45	R45	296	3957	25.676	1.921
18	R18	297	3922	25.589	1.938
44	R44	297	3957	25.589	1.921
47	R47	301	3938	25.249	1.93
41	R41	307	3944	24.756	1.927
12	R12	309	3938	24.595	1.93
20	R20	314	3933	24.204	1.932
14	R14	321	3950	23.676	1.924
15	R15	323	3950	23.529	1.924
28	R28	328	3940	23.171	1.929
21	R21	334	3948	22.754	1.925
22	R22	3703	3873	2.052	1.962
26	R26	3767	3724	2.018	2.041
5	R5	3777	3728	2.012	2.039
31	R31	4726	3873	1.608	1.962
36	R36	4806	3865	1.581	1.966
46	R46	4810	3634	1.58	2.091
42	R42	4885	3853	1.556	1.972
27	R27	4888	3582	1.555	2.122
34	R34	4950	3473	1.535	2.188
29	R29	5102	2975	1.49	2.555
30	R30	5104	2967	1.489	2.562
33	R33	5106	2964	1.488	2.564
23	R23	5111	2972	1.487	2.557
37	R37	5399	3649	1.408	2.083
38	R38	5548	3559	1.37	2.135

		1 inFarness	2 outFarness	3 inCloseness	4 outCloseness
16	R16	5550	3860	1.369	1.969
32	R32	5700	3789	1.333	2.006
58	R58	5700	2905	1.333	2.616
57	R57	5700	3795	1.333	2.003
48	R48	5700	3806	1.333	1.997
56	R56	5700	3407	1.333	2.231
49	R49	5701	3806	1.333	1.997
50	R50	5776	3882	1.316	1.958
3	R3	5852	3791	1.299	2.005
25	R25	5852	3877	1.299	1.96
51	R51	5852	3891	1.299	1.953
54	R54	5852	3343	1.299	2.273
55	R55	5852	3639	1.299	2.088
52	R52	5852	2679	1.299	2.837
53	R53	5852	2679	1.299	2.837
11	R11	5852	3867	1.299	1.965
59	R59	5852	3858	1.299	1.97
60	R60	5852	3579	1.299	2.123
61	R61	5852	3879	1.299	1.959
62	R62	5852	3412	1.299	2.227
63	R63	5852	3494	1.299	2.175
64	R64	5852	3707	1.299	2.05
65	R65	5852	3417	1.299	2.224
66	R66	5852	3860	1.299	1.969
67	R67	5852	2916	1.299	2.606
68	R68	5852	2890	1.299	2.63
69	R69	5852	3636	1.299	2.09
70	R70	5852	3847	1.299	1.976
71	R71	5852	3853	1.299	1.972
72	R72	5852	2904	1.299	2.617
73	R73	5852	3408	1.299	2.23
74	R74	5852	3486	1.299	2.18
75	R75	5852	3724	1.299	2.041
76	R76	5852	3495	1.299	2.175
77	R77	5852	2897	1.299	2.623

Statistics

		1 inFarness	2 outFarness	3 inCloseness	4 outCloseness
1	Minimum	180	2679	1.299	1.921
2	Average	3666.961	3666.961	11.329	2.096
3	Maximum	5852	3957	42.222	2.837
4	Sum	282356	282356	872.338	161.412
5	Standard D	2541.896	360.859	13.924	0.242
6	Variance	6461238	130219.5	193.872	0.059
7	SSQ	1.53E+09	1.05E+09	24810.89	342.867
8	MCSSQ	4.98E+08	10026905	14928.11	4.506
9	Euclidean N	39152.32	32332.88	157.515	18.517
10	Observatio	77	77	77	77
11	Missing	0	0	0	0

Appendix-J(III): UCINET results of Betweenness centrality of the Social Network for new Rules of Measurement

		1 Betweenness	2 nBetweenness
4	R4	586.447	10.289
10	R10	383.674	6.731
35	R35	306.026	5.369
19	R19	244.182	4.284
17	R17	231.342	4.059
9	R9	204.509	3.588
47	R47	203.176	3.564
8	R8	197.562	3.466
6	R6	191.676	3.363
20	R20	187.016	3.281
2	R2	177.45	3.113
40	R40	174.836	3.067
13	R13	147.727	2.592
7	R7	137.512	2.412
34	R34	126.861	2.226
21	R21	122.5	2.149
1	R1	116.957	2.052
43	R43	96.544	1.694
5	R5	92.861	1.629
39	R39	88.983	1.561
26	R26	79.512	1.395
12	R12	76.803	1.347
30	R30	76.743	1.346
24	R24	71.251	1.25
46	R46	71.075	1.247
22	R22	70.42	1.235
14	R14	68.363	1.199
33	R33	67.633	1.187
29	R29	66.275	1.163
18	R18	66.133	1.16
41	R41	64.56	1.133
31	R31	62.83	1.102
15	R15	59.363	1.041
36	R36	54.61	0.958
38	R38	54.083	0.949
28	R28	46.125	0.809
37	R37	45.167	0.792
42	R42	43.085	0.756
23	R23	36.626	0.643
27	R27	34.855	0.611
56	R56	33.417	0.586
16	R16	32.633	0.573
58	R58	31.083	0.545

		1 Betweenness	2 nBetweenness
32	R32	25.733	0.451
57	R57	15.5	0.272
45	R45	12.783	0.224
48	R48	11.333	0.199
44	R44	8.083	0.142
50	R50	7.417	0.13
49	R49	0.667	0.012
3	R3	0	0
25	R25	0	0
51	R51	0	0
54	R54	0	0
55	R55	0	0
52	R52	0	0
53	R53	0	0
11	R11	0	0
59	R59	0	0
60	R60	0	0
61	R61	0	0
62	R62	0	0
63	R63	0	0
64	R64	0	0
65	R65	0	0
66	R66	0	0
67	R67	0	0
68	R68	0	0
69	R69	0	0
70	R70	0	0
71	R71	0	0
72	R72	0	0
73	R73	0	0
74	R74	0	0
75	R75	0	0
76	R76	0	0
77	R77	0	0

DESCRIPTIVE STATISTICS FOR EACH MEASURE

		1 Betweenness	2 nBetweenness
1	Mean	70.286	1.233
2	Std D	99.78	1.751
3	Sum	5412	94.947
4	Variance	9956.055	3.064
5	SSQ	1147003	353.032
6	MCSSQ	766616.3	235.955
7	Euc Norm	1070.982	18.789
8	Minimum	0	0
9	Maximum	586.447	10.289
10	N of Obs	77	77

Network Centralization Index = 9.17%