CRITICAL SUCCESS FACTORS FOR THE IMPLEMENTATION OF PROBLEM SOLVING PRINCIPLES OF LEAN IN MALAYSIAN AUTOMOTIVE INDUSTRY

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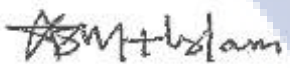

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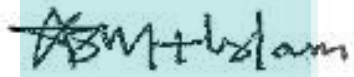

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ABSTRAK

"Lean" telah menjadi sistem pengurusan yang paling popular kerana ia memberi manfaat yang luar biasa dengan cara lebih mudah. Walaupun terdapat banyak literatur mengenai "Lean", kajian dalam butir-butir penyelesaian masalah yang lebih mendalam dan yang lebih spesifik adalah terhad. Kajian ini bertujuan untuk meneroka unsur-unsur asas prinsip penyelesaian masalah "Lean" dengan menekankan kepentingan mereka untuk mendapatkan lebih banyak keputusan yang boleh dipercayai. Analisis bijak elemen ini ditambah pendekatan kepada metodologi. Selepas menyusun dan menggred 36 faktor-faktor kejayaan, kajian kes telah dijalankan untuk menentukan faktor oleh "Focus Group" 16 ahli "lean" sigma dalam industri Automotif Malaysia. Kaedah percubaan membuat keputusan dan makmal digunakan untuk membandingkan kesan hubungan untuk mengetahui faktor-faktor kejayaan kritikal. Penggunaan kaedah ini untuk kedua-dua keseluruhan dan elemen analisis telah memberikan pandangan yang penting mengenai 17 faktor yang kritikal. Secara ringkas, penulis menafsirkan hasil: apabila terdapat keperluan yang menarik untuk membina budaya penyelesaian masalah tanpa "lean" dalam organisasi, pengurusan atasan perlu menghubungkan cabang prestasi dan akauntabiliti pekerja ke perniagaan strategi; dan mewujudkan kesedaran yang berkualiti dan menguruskan peningkatan dan pembelajaran yang berterusan dengan terperinci merancang dengan betul dengan memberi kuasa dan memotivasi pemilik proses pengeluaran dan jabatan lain termasuk pembekal untuk memahami proses itu, berkomunikasi dengan berkesan dan bekerja sebagai satu pasukan yang disediakan latihan yang betul untuk pengetahuan dan pemikiran baru untuk menggunakan satu set yang lengkap dengan prinsip dan alat. Akhir kata, satu rangka kerja konsep faktor kejayaan kritikal telah dibina mengikut persatuan dengan unsur-unsur prinsip tertentu. Bagi pengamal industri tanpa "Lean", keputusan ini diikuti dengan perbincangan yang sukar dan bijak akan membimbing untuk menubuhkan prinsip penyelesaian masalah dengan bersandar secara berkesan. Kajian ini juga mengarahkan untuk meneroka cara untuk mewujudkan prinsip-prinsip lain juga. Penulis menganggap bahawa kajian ini boleh mengambil pelaksanaan "Lean" ke peringkat kejayaan seterusnya.

ABSTRACT

Lean has become the most popular management system as it provides tremendous benefits in an easier way. Although there are abundant literatures on lean, study in deeper details which is specific to problem solving of lean is limited. This study is intended to explore standard elements of principles of problem solving in lean with emphasize on their importance to get more reliable results. This element wise analysis is an added approach to the methodology. After compiling and grading 36 success factors, a case study has been conducted to rank the factors by a focus group of 16 lean sigma experts in a Malaysian Automotive industry. Then Decision Making Trial and Laboratory method is used to compare pair wise impact relations to find out critical success factors. Applying this method for both overall and element wise analysis has provided important insights about 17 critical factors. In short, the author interprets the results that when there is a compelling need to build a lean problem solving culture in an organization, top management needs to link metrics of performance and accountability of employees to business strategy; and create quality awareness and manage continuous improvement and learning with detailed plan properly by empowering and motivating process owners in production and other departments including suppliers to understand the process, communicate effectively and work as a team provided right kind of training for new knowledge and mindset to apply the full set of principles and tools. Finally, a conceptual framework of critical success factors has been built as per association with specific elements of principles. For the industrial practitioners of lean, these results along with thoughtful discussions will guide to establish problem solving principles of lean effectively. This study also directs to explore ways to establish other principles as well. The author assumes that this research may take complete lean implementation to the next level of success.

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α	Threshold value
λ	Normalizing factor

LIST OF ABBREVIATIONS

SF	Success factor
CSF	Critical Success factor
PSP	Problem Solving Principle
LP	Lean Principle
CI	Continuous Improvement
JIT	Just-In-Time
TPS	Toyota Production System
LPS	Lean Production System
TPM	Total Productive Maintenance
MCDM	Multi Criteria Decision Making
AHP	Analytic Hierarchy Process
CVR	Content Validity Ratio
CKI	Cohen's Kappa Index
DEMATEL	Decision Making Trial and Evaluation Laboratory
IDM	Impact Relation Diagram
IRM	Impact Relation Map
MLPI	Malaysian Lean Production Index
MAJAICO	Malaysian-Japan Automotive Cooperation
ATEA	Automotive Technical Expert Assistances
MAI	Malaysian Automotive Institute
HICOM	Heavy Industries Corporation of Malaysia
HA	HICOM Automotive
VPP	Volkswagen Pekan Plant
AMM	Automotive Manufacturers (Malaysia) Sdn. Bhd.
NCV	National Commercial Vehicle
MTB	Malaysian Truck & Bus
DCM	DaimlerChrysler Malaysia
SD	Standard Deviation
R	Respondent
E	Element
F	Factor

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CHAPTER 1

INTRODUCTION

This chapter describes the background of the research, research gap, problem statement, research objective, research questions, scope of the research, significance of the research and definition of key terms. In the background section; overview of lean, problem solving in lean and success of the lean implementation are discussed.

1.1 Background of the Research

Toyota Production System (TPS), or what is now called 'lean' (Parsley, 2018), has recently received attention for the implementation of problem solving in it. Parsley (2018) analysed factors impacting problem solving engagement within lean systems implementation. In an article titled "Comparison of problem solving tools in lean organizations", Iuga and Rosca (2017) analyzed and compared the problem-solving methods recommended by the Toyota Production System, and Worley and Doolen (2015) also tried to investigate the impact of a lean implementation on the growth of employee problem-solving skills in their study titled "Organizational structure, employee problem solving, and lean implementation".

Though the current scenario of problem solving methods is becoming more and more complex because of the large number of available methods and the difficulty of creating a synthetic overall picture (Fantoni, 2006), lean method is successful because the problem solving process is superior (Pascal, 2007) to emphasize on people (Liker & Hoseus, 2009) who follow the problem solving principle (PSP). With an advanced stage of lean implementation, Toyota factories have environment with a low level of task uncertainty and a high-level of process architecture that does not change rapidly (i.e. low architectural ambiguity). In such an environment, problem detection can easily be taken for granted (Staats et al., 2011). But employees usually develop emotional

relationships with the process which results in the formation of hesitation in the process. Again, sometimes the problem of complication is compounded as a result of the fears portrayed within a system. It also stems from the amorphous workplace environment which is unstructured since sometimes it is decentralized as well as personalized. Consequently, organisations do not learn in the same manner they did previously. Hence, employees cannot afford to be inward focusing in the learning process. Moreover, ordinary employee does not understand the term complex. They are inclined to exploit the term inaccurately to any circumstance or problem (Kruger, 2015). These are the few examples that some factors related to problem solving and learning have intertwined impacts on each other.

Many companies have implemented lean but did not attain the goals (Anand & Kodali, 2011). Despite the well published accomplishments, many organisations even get trapped in the initial lean implementation efforts (Smalley, 2006). People are usually reluctant to change by nature, and due to well-worn neural pathways people find it comfortable to repeat things in the same way (Asefeso, 2014). In many cases, despite huge investment, organisations failed to achieve the benefits from lean they should have (Donovan, 2005). Ballé (2005) found that many implementations are rich in lean information and theory but poor in sustainable shop floor results, employee involvement and financial performance. Few organisations were able to apply lean successfully (Drew et al., 2016); especially in the way Toyota did (Ballé, 2005). The failure rates were as high as over 50% according to many lean advocates and professionals (Anand & Kodali, 2011), and the range is between 50% and 95% (Asefeso, 2014). Based on MIT study, Asefeso (2014) found that 70% of firms that institute lean don't sustain the improvements and in five years, they are back to the starting point.

In November 2006, Malaysia started a program under Malaysian-Japan Automotive Cooperation (MAJAICO) to bring in the practices of lean (SME Corp., 2010). The objective of this program is to upgrade the local automotive parts and components manufacturers to high value-added products and to improve their capacity and competitiveness through the lean production system (LPS). Until 2011, a total of 87 companies had participated and 220 improvement projects were completed under

guidance and monitoring of Japanese industrial experts with vast experience in the automotive industry (Chay, 2014).

To improve local automotive industries through the lean production system (LPS), MAI took a program, namely MAI-LPS program, under Automotive Technical Expert Assistances (ATEA) with 6 stages: business plan, operations, diversification, marketing and export. Jumping to the second stage which is LPS implementation focused only on the operational site, 20 companies saved a total amount of RM18.36 million which is from space utilization: RM 12m, man power: RM 0.36m, work in process (WIP) reduction: RM 4.2m, reject reduction: RM 1.2m and raw material stock holding: 0.6m. Later on, to benchmark with global automotive industries like JAPAN, a program named automotive supplier excellence program (ASEP) program has taken. This program also includes LPS as a tool for improving manufacturing process. The overall implementation plan of this sustainable manufacturing with lean production (SMLP) program is for 10 companies from 2013 to 2014, 60 companies from 2014 to 2017 and 120 companies from 2017 to 2020 to achieve world-class capability and competency levels in the future (Malaysia Automotive Institute, n.d.).

Putri et al. (2016) has done case studies to compare quality engineering practices in Malaysian and Indonesian automotive. For Malaysia, their findings indicate that both the companies studied have adopted the philosophy of lean management. In the meantime, Salimi (2013), Roslin et al. (2014) and Rose et al. (2014) revealed that lean implementation in Malaysia is still considered at an infancy stage and progressing slowly despite the benefits received through lean. Based on the Malaysian Lean Production Index (MLPI), lean implementation in Malaysia's manufacturing companies is just above an average (Agus & Hajinoor, 2012). Malaysian manufacturers should speed up their effort for lean implementation progress.

Implementations of lean in automotive industries in Malaysia are not far-reaching as expected. It seems that although the lean manufacturing strategy had long been introduced and implemented within various industries of the manufacturing sector, the truth is that the implementation of lean manufacturing in Malaysia, specifically in the automotive industry has only just begun (Roslin et al., 2014). The author could not find sufficient statistics on the success rates of lean implementations in the Malaysian

automotive, let alone the critical factors to ensure the successful implementation of PSPs of lean in Malaysian Auto industries.

The important thing that must be achieved by the company to classify which areas will produce the greatest "competitive leverages" is defined as critical success factor (CSF) (Brotherton & Shaw, 1996). Brotherton and Shaw (1996) highlight that CSFs are not main objectives, but the actions and processes that can be controlled by the management to achieve the organization's purpose. Boynton and Zmud (1984) defined CSFs as "those few things that must go well to ensure success". CSFs are very important in ensuring the successful implementation of lean, and to avoid failure risks such as generation of losses to an organization's cost, time and employee's efforts (Hamid, 2011). Timans et al. (2012) warned that if the conditions coupled with the CSFs are not achieved; then sustainable lean implementation has little likelihood of becoming reality. Therefore, identifying those factors that explain lean adoption process is a priority for those organizations that are planning to board on a lean manufacturing project (Forrester et al., 2010; So & Sun 2011). These factors act as facilitators or inhibitors during lean transformation process (Serrano et al., 2009). For a particular improvement program, CSFs are the vital ingredients that can be controlled by the management to meet the objectives (Boynton & Zmud, 1984). Organizations are required to understand CSFs to understand the risk of failure associated with lean implantation and therefore take actions to alleviate that risk (Kundu & Manohar, 2012).

It is evident that companies which are less than 10 years of establishment are less likely to implement lean as opposed to companies which are more than 20 years old. Equally, larger companies are more likely to adopt lean principles (LPs) (Tam & Chin, n.d.). Over 30 years in operation, HICOM Automotive (HA) of Malaysia has produced almost half a million vehicles of various international marques, with vision to become the preferred assembler in the automotive industry. In achieving that vision, HA has been abiding to strict global standards in operation and quality. HA has so far assembled more than 20 models, including renowned marques such as Mercedes-Benz, Suzuki, Volkswagen, Proton, TATA, Weststar, SsangYong and Commercial Vehicles (FUSO and Actros) (Corporate Info, 2018). Production volume of HA in 2016 was 8,181 for Mercedes-Benz and 3,683 for Volkswagen (Automotive industry, 2019).

Automotive industry is at the heart to bridge on the development of a nation (Sultana & Ibrahim, 2014; Rashid et al., 2015) and currently one of the world largest economic contributors with 98.9 million motor vehicles produced globally in 2017 (World production, 2018). The industry is a vital financial driver to the Malaysian economy (Sultana & Ibrahim, 2014; Mamat et al., 2015) as well. Currently, the automotive production is selected to increase the nation's development and to empower it to the position of an advanced country by 2020. The Malaysian domestic auto production is one of the foremost developed segments, and it signifies substance of domestic pride (Sultana & Ibrahim, 2014).

At present, with 29 vehicle producers and over 640 component manufacturers (Automotive industry, 2019) in the ASEAN Automotive Market, Malaysia has become the gateway to ASEAN market (Malaysian Investment, 2018) and the 3rd largest automotive market after Indonesia and Thailand in the passenger car segment (Sahari, 2015). And globally, it is the 23rd largest with an annual production of over 500,000 vehicles. As a whole, automotive industry contributes 4% or RM 40 billion to Malaysia's gross domestic product **(**GDP), and employs a workforce of over 700,000 throughout a nationwide ecosystem (Automotive industry, 2019). Current status of Malaysian automotive is presented in Table 1.1.

Table 1.1 Performance of Malaysian Automotive Industry

Key Figures	**2017**	**2018**
Total Industry Production (units)	510,000-515,000	530,000-535,002
Total Industry Volume (units)	575,000-580,000	586,000-591,002
GDP	4.00%	4.50%
Workforce (no.)	736,632	755,634
Vehicle Manufacturers (no.)	27	29
Complete Built-Up (CBU) exports (units)	20,604	34,002
CBU exports (RMb)	1.5	1.8

Source: Malaysian Industrial Development (2018)

1.2 Research Problem

In the book "Lean Implementation: Why Lean Fails and How to Prevent failures", Asefeso (2014) conducted a large survey in 2012 resulted as only 2% of the companies have achieved their anticipated results from lean. Some companies have reduced "Doing Lean" to running small kaizen workshops here and there without

stability or link to a strategic intent. It is merely about patching broken processes, solving local problems at best, or opportunistic muda hunting (Hohmann, 2017b).

According to Coetzee et al. (2016), so far, lean implementation strategies focus the least on principles in the problem-solving layer. This is a point of concern, since the reason for implementing lean principles is for continuous improvement (CI) and it can not be achieved without solving problems. To be specific, some focus is given to becoming a learning organisation by means of CI, but no consideration is given to the 'go and see' principle or the 'make decisions slowly by consensus' principle (Coetzee et al., 2016) although finding solutions is difficult for many reasons. Moreover, enough research is not available on identifying both direct and indirect influences among critical factors for successful implementation of PSPs of lean.

Again, a research (Marodin & Saurin, 2013) on lean manufacturing literature from 1996 to the first quarter of 2012 exposed that only 14% of studies were conducted in developing countries whereas 86% have been conducted in the developed western countries. The distinctive circumstances or needs in Malaysian manufacturing organisations need to be determined and considered in an attempt to identify the CSFs for lean implementation in this context. Bon and Karim (2011) raised an issue about the transparency of the implementation of lean manufacturing in Malaysian industries. Additionally, they pointed out that case study of lean in Malaysian industry is limited.

According to Malaysian Automotive Institute (MAI), 120 Malaysian automotive companies are planned to implement lean under Automotive Supplier Excellence Programme (ASEP) from 2017 to 2020 (Malaysia Automotive Institute, n.d.). But to implement lean without the preparation, commitment and strategy involved in how to do it, is never recommended. Asefeso (2014) warned that without a good strategy and those other factors in place, lean implementation is pretty much going to fail at some point in time. Strategic plan to establish principles of lean in Malaysian automotive are not evident in contemporary literatures.

One of the principles within lean manufacturing is Kaizen (Coetzee et al., 2016) which is the continuous improvement aspect within lean manufacturing (Bhuiyan & Baghel, 2005). Putri et al. (2016) found in their both case study companies in Malaysia who have taken lean initiatives, that the Kaizen initiatives have not been effectively

implemented. Team members are not encouraged to solve problems in teamwork approach. In addition, top management is not encouraging individual development in relation to continuous improvement. At the same time, the team is not given full right in making decisions for problems. Team members must first report to middle management if they find problems, then middle management report to top management. Top management is less active in conducting direct observations in shop floor and providing on-the-job training. Direct observation activities are only done by middle management. Top management is only waiting for a report from middle management (Putri et al., 2016). But for problem solving in lean management, leaders are not excused to see and thoroughly understand the situation by themselves (Liker, 2005) though they have to face relentless unpredictability in the current context of increasingly rapid change and increased competition due to globalization. As their ability to cope up with new and open ended problems is persistently challenged, it is vital for managers to be competent of imagining applicable and resourceful solutions (Myszkowski et al., 2015).

Studies on lean in context of Malaysia have been carried out on the basis of overall impact of success factors on lean implementation (Fadly & Mohd, 2013; Rose et al., 2014; Roslin et al., 2014). The top factors based on overall influence may miss some factors which are not dominant in overall score but have higher impacts on a specific element of single lean principle. The future research should be done in understanding the success factors of problem solving in details (Choo et al., 2015), so that Malaysian automotive companies, which are trying to be lean, can address CSFs of PSPs to implement successfully and also be encouraged to go for deeper understanding of other principles of lean.

1.3 Research Objectives

There are four objectives to conduct this research as given below:

1. To grade SFs for the implementation of elements of PSPs of lean management
2. To analyze overall interrelationships among SFs for PSPs of lean in Malaysian automotive industry to rank the SFs and to find net causes and net effects

3. To analyze element wise interrelationships among SFs for PSPs of lean in Malaysian automotive industry to compare with overall interrelationships and finalize critical SFs
4. To develop a framework for CSFs for the implementation of PSPs of lean in Malaysian automotive industry

1.4 Research Questions

This study attempts to answer the following research questions:

1. Which SFs can be grouped together as per higher degree of relevance for the implementation of elements of PSPs of lean?
2. How to rank the SFs and find net causes and net effects based on the interrelationships among SFs for the overall implementation of elements of PSPs of lean in Malaysian automotive industry?
3. How to compare the interrelationships among SFs for the element wise implementation of PSPs of lean with overall interrelationships and finalize CSFs for Malaysian automotive industry?
4. How are the CSFs for the implementation of the elements of PSPs of lean interlinked in a framework in context of Malaysian automotive industry?

1.5 Scope of the Research

The scope of this thesis is established by underlining the steps taken to fulfill the objectives proposed. The primary scope is to find the PSPs of lean from the existing literature of the principles of lean. Then those principles are further decomposed into elements. All the SFs for the implementation of lean or other change managements in manufacturing are compiled.

The cause and effect relationships of the SFs in every group of elements of problem solving are developed separately in context of HICOM Automotive Manufacturers (Malaysia) Sdn. Bhd., DRB-HICOM Automotive Complex, 26607, Pekan, Pahang, Malaysia. Process Engineering, Productions / Operations, Engineering / Technical / Maintenance, Industrial Engineering, Quality Management, HR / Training, Marketing / Sales, Safety / Health / Environment, Finance / Administration, Logistics / Distribution / Procurement and Information Technology are in scope. The critical factors for all elements together are decided as total CSFs for the implementation of PSPs of lean in Malaysian automotive.

1.6 Definition of Key Terms

Automotive: Automotive means "propelled by a self-contained motor, engine or the like". The term "Automotive" is used to refer to the design and development; manufacturing; marketing and selling of vehicles (The definition, n.d.).

Critical Success Factor: Critical Success Factors are those variables or circumstances necessary to enable a positive outcome for a business program or strategy (Reh, 2017).

Lean: Lean has been defined as a system (Hopp & Spearman, 2004), a philosophy (De Treville & Antonakis, 2006) an approach (Taj & Morosan, 2011; Anvari et al., 2011) applicable in entire value stream (Czabke, 2007) in manufacturing (Seth & Gupta, 2005; Taj & Berro, 2006) including supply management (Howell, 1999) to eliminate waste (Saengchai & Jermsittiparsert, 2019; Chetthamrongchai & Jermsittiparsert, 2019; Kerdpitak & Jermsittiparsert, 2020), reduce required time (Taj & Morosan, 2011), ensure quality and lower cost (Krafcik, 1988) by minimizing inventories and using less resource (Krafcik, 1988; Womack & Jones, 1996; Dennis, 2016).

Problem Solving: Problem solving is a practice of finding and selecting solutions to organizational problems in the design, development, and bringing new products to market (Dosi & Grazzi, 2006; Atuahene-Gima & Wei, 2011).

1.7 Organization of the Thesis

The current research has been organized to provide features on the particulars, data collection, analysis, interpretations and the way to meet the objectives. This thesis contains five chapters. In chapter 1 (Introduction), a concise introduction to lean, problem solving in lean and success of the lean implementation is discussed. Then problem statement is articulated with some basis and rational to find the direction for the study. Research objectives and questions are presented along with the scope of the study to be covered. Significance of the research has been elaborated as well. Chapter 2 (literature Review) presents reviews of published literature covering topics related to this study. Chapter 3 (Methodology) describes the methods applied in this research. The research design and data collection plan have been elaborated along with analysis tool. Chapter 4 (Findings and Results) presents the findings from the analysis carried out as in chapter 3. A comprehensive discussion pertaining to the results obtained in this research and those from other studies are compared. In chapter 5 (Discussion and Conclusion), decisions have been made based on the results and discussions to conclude the current study. The recommendations for future studies are made from the understandings of the present study based on their importance and significance are further investigated and explored in this area.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter provides the details on lean Principles, PSPs of lean, success of lean implementation, lean in Malaysian automotive, Malaysian automotive industry. The section PSPs of lean has the sub-sections of problem solving, problem solving in lean, PSPs of lean and list of elements of PSPs of lean. Description of success factors and list of SFs of lean are described in the section of success of lean implementation. Mainly, lists for the elements of PSPs and SFs are constructed in this chapter.

2.2 Lean Principles

Krafcik (1988) initially proposed the term "Lean" in his thesis on bridging the significant performance gap between Western and Japanese automotive industries at Massachusetts Institute of Technology (Hu et al., 2015). Later on, lean was popularized by two books named "The Machine that changed the World" (Samuel et al., 2015) and "Lean thinking" (Womack & Jones, 1996). Now lean remains as a thing for only true believers (Hohmann, 2017a) to eliminate waste and reduce time (Islam et al., 2018b).

After the Second World War, lean manufacturing started with the design of Toyota production system under the leadership of Taichi Ohno and Shigeo Shingo (Liker & Hoseus, 2008). Primarily, lean practices were implemented based on several ideologies that appeared prior to it such as Just-In-Time (JIT) (Monden, 1983), Zero Inventories (Hall, 1983), Japanese Manufacturing Techniques (Schonberger, 1982), TPS (Ōno, 1988; Monden, 1983) etc. Now lean tools commonly applied include Kaizen, Kanban, JIT, Total Productive Maintenance (TPM), the 7 wastes concept (*Muda*), and the 5S workplace methodology (Herron & Braiden, 2006) etc.

It is unanimously accepted that being lean is quite beneficial (Bhamu et al., 2014) and the core benefits of lean have become the standard for many manufacturing operations. Poduval and Pramod (2015) claimed that lean can help in enhancing an organization's productivity and reducing costs. In addition, well-implemented lean enables to reduce lead time and response rapidly towards customer orders. Also Mirzaei (2011), and Mrugalska and Wyrwicka (2017) have found a good number of benefits of lean implementation in large business; such as access to resources; experienced employees in continuous improvement; understanding possible benefits, processes, requirements and challenges; ease of making the dedication of human resources; applicability of tools; opportunity for efficiency for not standardized processes and negotiating power over suppliers to build up a lean supply chain easier.

If a business wants to be leaner, firstly, it is required to be examined as a whole (Chase, 1999) which includes the way of processing items, purchasing materials and manufacturing goods. Lathin and Mitchell (2001) emphasized the need of the "socio-technical system" (technical and social systems combined). This is in line with Lander and Liker (2007) who highlighted the socio-technical perspective of lean, and described lean based on technical (tools) aspects and social aspects (utilizing people capabilities).

Bhiami (2003), and Dahlgaard and Dahlgaard-Park (2006) show that in introduction phase, new tools and management control systems need to be adopted to the present culture and management practice to avoid failure, and this is a general understanding shared widely. But in academic sense, each situation is so much location oriented that the values, norms and rituals must reflect the needs of that exact circumstances and thus, any attempts to prescribe right methods are wide of the mark and unsophisticated. Most researchers associate the study of tools with a cookbook approach and find it disreputable. In contrast, there are respects in which, lean presents a set of universally desirable elements. That is not to say that the lean presents an all-inclusive set, or even a "best" set, but it does has some specific popular elements that appear to be applicable across the situations (Alpenberg & Scarbrough, 2009).

In Operations Management, Lean has been role models for describing continuous improvement tools and behaviour (Liker & Convis, 2011). Positive practices such as inquiring into what already works and generative conversation, has

the potential to enable learning cultures and transformational change (Bushe & Kassam, 2005).

The principles of lean are a set of beliefs in what it works. Lean connects organizational rules of production system and organizational culture (Liker & Hosesus, 2008). It always starts with the customer considering what activity will add value to the end-customer with minimum waste. Then recognize that any process will still be containing a significant amount of waste. Getting out the waste takes time and experience with the process. It is a learning process of continuous improvement, and only those working in and managing the process can advance it on a daily basis.

Lean has undergone incredible advance over the last 40 years (Spear, 2004). Liker (2005), taxonomically, categorizes his observations and reports that there are four key elements which form the foundations for the norms and values that everyone is supposed to follow when interacting with each other. He also summarised the 14 principles of Toyota management system into four categories in a 4P model: "Philosophy; Process; People and partners; and Problem Solving" as shown in Figure 2.1. The first category, philosophy, is proposed to communicate the importance of long-term thinking in all management decisions even sacrificing short-term financial goals. This type of thinking is supposed to apply to a large number of situations in any organizations.

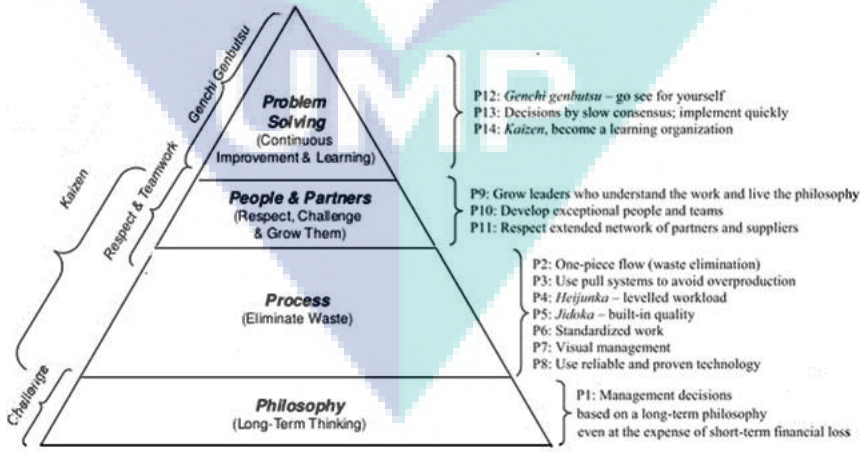

Figure 2.1 4P Model of Toyota.

Source: Liker (2005)

One aspect of this dedication should be long term funds in developing people as a commitment of senior management. This is not only reflected on the surface through artifacts and behaviours but also on deeper levels including underlying assumptions. Servant leadership illustrates this by addressing the role of management from a value-added perspective. Usually, managers are not seen adding value naturally; they contribute to the value-adding work done by others, which, in essence, is about encouraging involvement and dedication to continuous improvement. Evidence of this long term thinking can be found on display in the plants and is, for instance, formulated in the motto posted at the Toyota Motor Manufacturing Cambridge (TMMC) plant in Ontario, Canada: "Quality first, Customer satisfaction always".

The second category in the value-system, according to Liker and Hoseus (2009), is the right process and the intended aim is to get rid of all kind of waste in the company and strive for the right process. In the TPS Archetype, waste is almost entirely defined with respect to customer needs. This is done through a focus on the flow of activities in order to surface problems. Fundamental for waste elimination is also the pull system which is designed to avoid over-production. Without the exact demand from a process downwards the value-chain, nothing is produced to supply, so there is no require for any inventories between any two activities.

Standardized task means a way to systematically work with continuous improvement, Kaizen. There should be a clear instruction to every employee how to conduct every activity and in this way allow the workers to perform value-added work. The last part of the second category is to use only reliable and thoroughly tested technology (Liker & Hoseus, 2009).

The third category is called "develop people and partners" and is focused on adding value through raising leaders within the company who live the philosophy. This people-supporting element consist of both the unscripted daily behaviour of leaders and team members who work cooperatively to get the job done, as well as the formal structured processes like quality circles, early symptom investigations and scheduled meetings. This work can be seen as the artifact and behaviour norm level of culture through, for instance, job rotation, 5-Why questions, 5S, daily safety meetings and energized leaders. On the behavioral norm level, this is transparent through clear standards, two-way communication and focus on the problem and not on the person.

The underlying assumptions: leaders are teachers and coaches; have continuous commitment to a safety culture and leaders supporting those workers that add value (Alpenberg & Scarbrough, 2009).

The principle number 12, 13 and 14 have been grouped into the fourth category of problem solving which covers the tenets of continuous improvement and learning (Liker, 2005; Liker & Meier, 2006). Principle 12 is imperative in order to understand the organization's problems that need to be solved or improved. Additionally, Principles 12 and 13 are essential ways of including people in the problem-identification and -solving process (Coetzee et al., 2016). Kaizen is planned to drive continual organizational learning. One way to accommodate this learning is to make decisions slowly by total agreement at a time, investigating ins and outs of all options and implement the improvements quickly. The decision process also requires the manager to "go and see for yourself" in order to meticulously understand the situation (*Genchi Genbutsu*) (Alpenberg & Scarbrough, 2009).

Ahlstrom and Karlsson in their studies on lean manufacturing implementation in small firms suggest lean manufacturing consists of eight principles (Åhlström, 1998): elimination of waste, zero defects, pull scheduling, multifunctional teams, delayering, team leaders, vertical information systems and continuous improvement. There are some companies that have used the five principles of lean (Womack, & Jones, 2003; Joosten et al., 2009): value, value stream, flow, pull and perfection; and adapted them too fast with no real deeper philosophy behind the implementation (Ballé, 2005). Many companies try to replicate Toyota's success but failed to match the dramatic improvement achieved by Toyota. The companies are missing out a lot when they do not look at the whole picture.

TPS is somewhat broader than lean; it is more than just a set of lean tools. As lean evolved from TPS, their principles are similar; but organized differently, and not always identical. TPS and lean are quite sophisticated and the holistic approach is the key to the success of their implementation. Both TPS and lean can be defined as very similar business philosophies; however, TPS puts more emphasis on the principles of the Toyota Way, while lean is more of a continuous improvement methodology similar to other methodologies such as total quality management (TQM), JIT and Six Sigma (Kochnev, 2007).

One may speculate that lean is an adaptation of the Eastern philosophy of Toyota to the Western thinking. In fact, it is putting the Toyota principles to work in a way that is easier for the Western culture to understand and apply. Liker has written in the book named “Toyota Way”: "If you are using the Toyota Way to become lean, the lesson here is that you don't have to get hung up imitating Toyota's use of specific tools so you can appear to be lean like Toyota. The Toyota Way is a philosophy and a set of tools that must be appropriately applied to your situation. But understand that these principles are something to believe and strive for. They are part of a greater system that is seeking harmony and perfection to sustain success" (Liker, 2005).

Mohamed (2016) advocates that lean aids the organisations’ problem solving techniques and standardization in a way that is easy and sustainable. He has also stated that the TPS, The Toyota Way and the whole management behind Lean thinking is based on TPS principles where the problem solving principle includes continuous learning, which enables continuous improvement. In this principle, organisations learn through “Kaizen”, which means improvement in Japanese. The kaizen technique has a insightful impact on the determination of the problem and creating a solution for it. Kaizen is to realize the main issue, to create ways to improve it or to eliminate it. In addition, these processes are then monitored for a particular period of time to see the received results (Liker, 2003; Mohamed, 2016).

The book named Lean for Dummies (Sayer & Williams, 2012) hits all the high points of TPS principle in a summarized fashion while the Hitchhiker’s Guide to Lean (Flinchbaugh & Carlino, 2006) lists five practices for “personal lean”, the last one of which is “see more with your own eyes”. Even though the TPS principle is covered in the lean literature, it is missing one important element that is abundant in The Toyota Way: examples of the application of this principle. If one compares the way Liker presents principle number 12 with the way it is presented in the lean literature, the comparison between the eastern culture and the western way of thinking is almost inevitable. Liker emphasizes the “deep understanding” and presents this principle as the Japanese would see it; the lean approach is more of an adaptation of the TPS principle to the western culture. In conclusion, although the principle number 12 is not presented in the lean literature as convincingly as it is in The Toyota Way, it is essentially the same in both TPS and Lean (Kochnev, 2007).

The lean manufacturing problem solving philosophy is an accessible and easy to understand notion. It is also a main part of entire TPS philosophy (Iuga & Rosca, 2017). But decision making is not the central point in lean problem solving literature in contrast to TPS literature. The principle number 13 is about analyzing thorough consideration of alternatives, obtaining many people's input and thus generating consensus, clearly communicating on a single piece of paper and improving the decision making. Not many out of all of these elements are reflected in the Lean books. The Hitchhiker's Guide to Lean (Flinchbaugh & Carlino, 2006) is the only lean source that touches on this TPS principle; it formulates lean principle: "Establish agreement on what and how". This lean principle is, however, mostly concerned with collaborative standardization and answering the question about how the "what" will be achieved. In essence, TPS principle number thirteen is about good decision-making and building the consensus needed for the successful implementation; Kochnev (2007) could not recognize such guidance in the lean literature.

Books on lean cover the spectrum of the TPS principle number 14. Especially, identifying root causes through the 5-Why method is well described (Womack & Jones, 1996; Flinchbaugh & Carlino, 2006; Sayer & Williams, 2012). Also, building learning organization and the transition to a lean enterprise are discussed as one of the central topics (Liker, 1997) and one of the main topics (Sayer & Williams, 2012). Metrics are very briefly covered in "Lean for Dummies" (Sayer & Williams, 2012). But Plan-Do-Check-Act method described in "The Toyota Way" is well illustrated across many books and articles. To recapitulate, despite some of the misalignments between lean and TPS in the presentation of this last TPS principle, overall it can be considered as a point of similarity (Kochnev, 2007).

2.3 Problem Solving

According to D'Zurilla and Goldfried (1971), problem solving is "a behavioural process which makes available a variety of response alternatives". Minztberg et al. (1976) defined it and decision-making synonymously as "a set of actions that begins with the identification of a stimulus for action and ends with the specific commitment to action". Mayer and Wittrock (2006) define problem solving as "cognitive processing directed at achieving a goal." Atuahene-Gima and Wei (2011) define problem solving as "a process of seeking, defining, evaluating, and implementing solutions".

Through the years, the problem solving literature has developed into an extensive body of work. It includes problem-solving processes (Simon, 1960), approaches (Calantone et al., 1998), support systems (Wierenga & Bruggen, 1997); orientations (Sirdeshmukh et al., 2002), creative problem-solving (Burroughs & Mick, 2004); competence (Atuahene et al., 2011), joint or group problem-solving (Aarikka-Stenroos & Jaakkola, 2012) etc. To establish corrective action, Ford Motor Company first developed a problem-solving process as standard which was based on analysis of root causes of the problem statistically (ASQ, 2016).

Problem solving in lean manufacturing is a main part of entire Toyota Production System (TPS) philosophy. Toyota enforces basic problem-solving to all employees (Iuga & Rosca, 2017). Whenever an organization solves a new problem, it creates new knowledge which can then be used again to solve new problems giving life to a sort of learning spiral. Thus organizations gain ability to extend their capacity to create their future (Senge, 1990). Also, it is through problem solving activities that an organization will improve the understanding of its adjacent environment and increase its absorptive capacity. Moreover, the time the organization spends in problem solving will increase the accumulation of knowledge, allowing the organization to adjust better to the environment (Gray & Chan, 2000).

Yahya and Goh (2002) found empirical support that problem solving skills are very successful in supporting knowledge creation and transfer. In an experiential study, Massingham and Massingham (2014) concluded that the most influential argument in order to convince managers to investing in knowledge management (KM) practices are the benefits gained from problem solving. This result highlights the importance of problem solving within the overall KM initiatives of firms. However, a study by the McKinsey Global Institute (2011) claimed that by 2018, there would be a shortfall of one and a half million managers in the United States of America with the required skill-set of problem solving (Giampaoli et al., 2017).

In the lean management, every worker is encouraged to contribute to the problem solving. When workers are turned into problem solvers, they can feel the power which comes with making improvements. Liker and Hoseus (2009) has pointed out that lean is intended to bring problems to the surface where people serve the function of problem detectors and problem solvers; provided the below conditions:

1. Standard operating procedure is available for team members to recognize deviations as problems
2. Team members are well trained in problem solving methods and on the standards to understand those clearly
3. Team members have no fear of getting in trouble or lead to job loss due to exposing a problem
4. Team members are motivated to achieve company goals

The process of problem solving, irrespective of the problem type, naturally begins when someone appeals to any "goal-directed sequence of cognitive operations" (Anderson, 1985). At the first stage, simply knowing about particular effective tools provide some hypothetical insight into the processes. Then these tools may be combined to develop training programs supported by experimental research (Vernon et al., 2016). But the ability to solve problems creatively depends on the person's knowledge, memory and cognitive style including the ability to tolerate uncertainty (Hoover & Feldhusen, 1994). In case of a process problem like bottlenecks or defects, after receiving the information about the current practice and objective, analysts develop some solutions and identify the preferred one, and then develop the future process. Finally, the assessment of the new process is done in respect to the original objective (Figl & Recker, 2016).

Problem solving involves the development and acquisition of new knowledge, and its selection, explanation, codification and distribution into new practices, processes, or products (Argote & Ingram, 2000). For problem-solving, many organisations utilize temporary groups; e.g. cross-functional or multidisciplinary project teams, which gather experts from different areas of expertise (Edmondson, 2012). Problem-solving activities are mechanisms for learning and for changing the range of possible behaviours by promoting individual and organizational understanding of the environment, and its challenges and opportunities (Nonaka & Takeuchi, 1995).

Human problem solving has been well studied and researched in understanding the basic cognitive process of human thought (Heppner et al., 2004). The integral

relationship of problem solving and learning can be seen in relation to Revans (2001). His well-known equation: L = P + Q, which conveys that learning (L) derives from a combination of the questions posed about a situation (Q) coupled with what is previously known or established knowledge (P). For Revans, this always started with inquiring into, in other words articulating questions about the unknown, an issue or situation we do not understand, which is therefore making it challenging. At heart of this relationship are the historical origins of action learning as a philosophy rather than a set of techniques, a way in which learners might develop wisdom, not simply cleverness (Rigg, 2015).

Hall (2017) discussed one difficulty in understanding problem-solving is that it is often conflated with decision-making. Decision-making is usually regarded as an individual (or group) choosing among alternative solutions (Simon, 1960; Kahneman & Tversky, 1979). Some authors use these terms synonymously or interchangeably (Simon, 1960; Kahneman 2011). Some regard problem-solving as an element of decision-making (Minztberg et al., 1976); and others regard decision making as an element of problem-solving. And still for others a decision starts with a problem and/or a problem ends with a decision.

In theory, problem solving takes up a problem as the entity of analysis, and revolves around the detection of problem characteristics creating barriers to find a solution (Nickerson et al., 2012). But the theorists disagree that task uncertainty is largely determined by problem structure and complexity (Baer et al., 2013), and believe that identifying "need-solution pairs" is advantageous as the area of the solution space is not pre-selected implicitly by defining the problem too narrowly (Andriani et al., 2017). On the other hand, Choo et al. (2015) warns that suggestive problem solving by executive may harm the company's internal knowledge stocks by reducing levels of incremental and necessary improvements. Therefore, firms that engage in apparently harmless quick-fix approach of problem solving can fall into the trap of decreasing long-term competitiveness.

Problem solving is one of the most significant aspects of an organization. If it is practiced effectively, it can increase the productivity and decrease the defect rate. A structured problem-solving approach has a direct correlation to an organization's consistent performance (Carlton & Perloff, 2005).

2.3.1 Problem Solving in Lean

Many companies implement the problem-solving method but fail to achieve the same level of success Because of some difficulties e.g. no agreement among stakeholders on what the problem is, no buy-in among team members, poor planning, lack of management support etc. (Marchwinski, 2012). To maximize problem solving performance, two tactics may be used: leverage and focus. All employees should be trained and encouraged to take part in regular problem solving activities. When many problem solvers each contributes in frequent, small, continuous improvements, we can achieve tremendous leverage from their combined efforts. Applying the 80/20 rule we can effectively focus our 80 percent energy on the 20 percent of problems to harness 80 percent of the total benefit (Liker & Meier, 2006). But focus should be many quick and simple experiments in stead of few lengthy and complex ones to allow the analysts to test their ideas as frequently as possible (Spear, 2004).

The corresponding indicators can be used to support the process of focusing on the most important issues. Problems can be prioritized based on their comparative importance, urgency and tendency (Liker & Meier, 2006). Tendency reflects whether the problem is improving, staying the same, or getting worse. The most countermeasures should be implemented quickly (within a week). The primary understanding is that a short-term countermeasure refers to one that is temporary like "Band-Aid" that provides temporary relief until a more effective or extensive solution can be implemented. A small improvement with minor effort yielding perhaps one second of time or one cent per piece over the six-month period is a practical idea. Improvement must occur at all times at all levels by all employees. No rules suggesting appropriate times and conditions for improvement should be applied so that the spirit of continuous improvement is sustained. Basic problem-solving skills are obligatory for all employees to become a problem solver. With thousands of people solving problems on a daily basis effectively leverage the human resource. For most issues encountered daily, the basic methods are adequate but problems of a more complex nature require a higher degree of skill, and to solve these, members of management need to be trained via management kaizen events (Liker & Meier, 2006).

The implementation of problem solving in most of the organizations is practiced with just a form where all the boxes are to fill in. As such, the problem solvers apply their own thinking to solve their problem without focusing on the methodology, and document their results on the template after the fact. So a new problem-solving methodology has no impact on users' thinking because the thinking of other employees has remained the same. To change an individual; the norms, values, beliefs of his or her organization need to be addressed (Marksberry et al., 2011).

A lean system is effective because of its inherent characteristic which aims to find the source of problems to avoid any repetition of occurrence (Mann, 2010). Other authors emphasized on five-why process as the key to relate problems with their causes (Liker & Meier, 2006). But the work of researcher argues that repeating the learning of Plan-Do-Check-Act (PDCA) cycle (Deming, 1986) along with continuous improvement makes a problem-solving methodology successful (Bicheno, 2008).

It is the responsibility of management to establish expectations for the organization, to identify weak points in the system, and to apply the appropriate resources. Mid-level opportunities are generally initiated by the supervisor. These items may be based on overall company objectives for improvement or on issues of particular challenge to the group affected. Most of the time, the individual or small team initiates these efforts. Each person understands the process of continuous improvement and pursues that objective in his or her daily activities (Liker & Meier, 2006).

Expectations from day to day problem solving highly depend on a company's organization structure. Based on expansion of the scope of problems, they are escalated from team level to the group level to the section level. But, problem solving needs to be supported at all levels of the organization. Hence the mechanism of approval process for trial runs should be the same across all levels so that the management gets the whole organization implementing countermeasures with minimum effort (Marksberry et al., 2011).

Recently, authors (Marksberry et al., 2011) have pointed to the 8-step process in Figure 2.2 as successful which mirrors the PDCA cycle of lean problem solving. It is a scientific approach for knowledge creation. Solutions are tested in controlled conditions to find how the countermeasure changes the outcomes. To make decisions and engage employees to develop countermeasures naturally, the organization should train its managers to develop intense coaching capability as early as in step of problem breakdown (Marksberry et al., 2011). Researchers point to soft-sided approach and supporting culture what make this method effective (Liker & Hoseus 2008).

Asefeso (2014) recommends the classic PDCA cycle for the problem solving should start with an expected future state in stead of thinking that the current state is "broken". Then compare the future state with the current state, find the gap and brainstorms solutions to fill the gap. Finally the team as a group needs to adjust the plan based on learning by checking, and do it again (Asefeso, 2014).

Managers outside of Toyota will most likely feel that the pace of the 8-step problem solving process is slow, and be tempted to speed up the steps. Consequently, managers may also indirectly act upon problem solving for their sub-ordinates by not knowing how to coach or teach the process. But lean managers should perform their role as a facilitator by taking on a coaching role that protects the learners from failing but leave themselves revival if they choose any wrong pathway. While managers have the ultimate responsibility and outcome for their individual units, lean sees managers as approving trials to test their worker's ideas. Only way to motivate employees is approving them to contribute their ideas towards the problem solving activity (Marksberry et al., 2011).

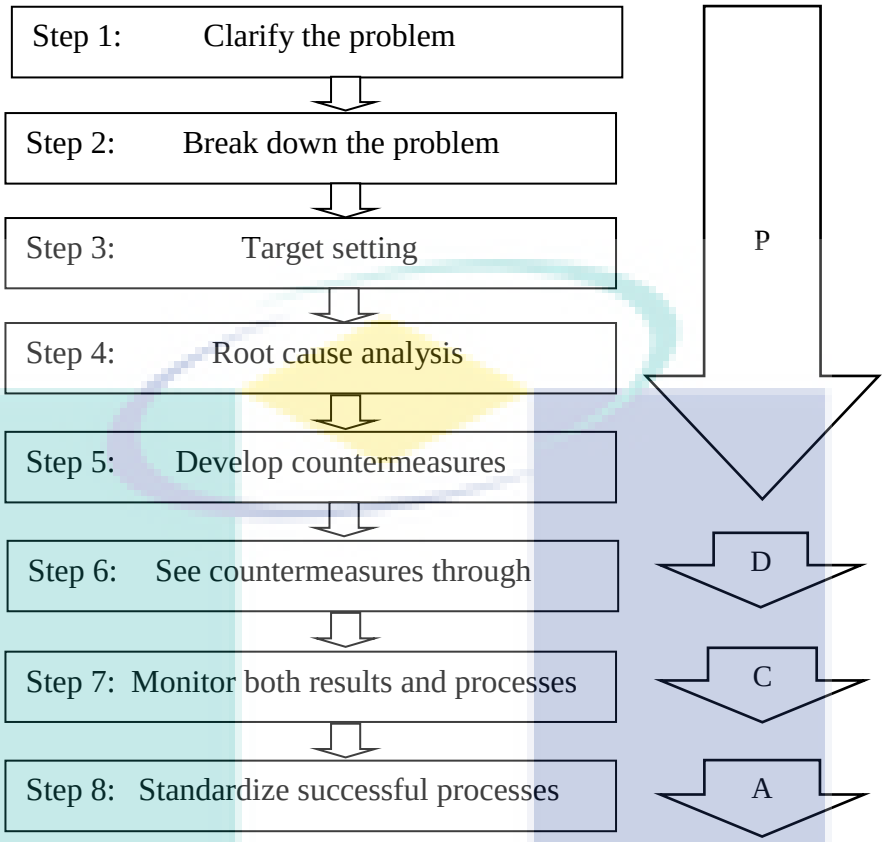

Figure 2.2 Toyota's 8-Step Process of Problem Solving

Source: Marksberry et al. (2011)

Womack (2007) explains how the process of problem solving should be followed in order to show mutual respect between managers and workers: Manager(s) will ask the employee(s) about the problem(s) they are experiencing. A dialogue will follow to determine not just the surface problem rather the true problem. The potential root cause will be discussed after the worker has gathered sufficient proof by means of the *genchi genbutsu* principle. The employee is given the chance to make suggestions about solving the problem and to clarify the reason for the chosen solution. Employees are also required to make suggestions about the best indicators of when the problem is solved. Finally, when the agreement is attained on the most fitting measure of success, the employees set out to implement the solution (Coetzee et al., 2016).

Lean is to build a long-lasting learning organization in which problems are continuously surfaced and team associates are well-equipped with the tools to eradicate waste. When this occurs, a long-term capability is developed for improvement and

adaptation to the environment. Kaizen workshops should be part of a longer term strategy. When one operation reaches the level of good flow, the second process is stabilized, then the two processes are connected making each process dependent on the other, and this continues until all operations from the first operation to the last in the value stream are connected for flow with minimal stoppages (Liker & Meier, 2006).

Organizations need to build a culture of training people to identify problems, to immediately alert the leader, to contribute in root cause analysis, and to find opportunities for improvement regularly. Engineers are expected to be taught not only the specific technical know-how but also how to observe a process, how to detect problems, how to communicate, how to get others engaged, how to be a team player, how to develop A3 reports, how to develop standards etc. (Liker & Meier, 2006). Before e-mail A3 was the largest size of paper (11 X 17 inches) that could be faxed. Also the 8-step process is usually called as A3 problem solving (Ōno, 1988; Heppner et al., 2004; Liker & Hoseus, 2008, 2009).

Lean managers need to engage themselves primarily by using delegation and less through hands-on skill demonstration but not towards kaizen. Delegation is required because no manager can do all the work of their individual business unit. In lean, delegation is about deciding how to assign work so that employees can feel that the work is theirs while the most significant aspect of delegation is deciding which aspects of a project to delegate. Toyota managers are trained to use delegation to reinforce how work standards are achieved in the workplace (Marksberry et al., 2011).

Though problems are subjective; to identify them is a social exercise (Weick, 1993). For example, Toyota works on waste in a way General Motors did not. Taiichi Ohno, the principal creator of the Toyota Production System, noted, "To get rid of waste, train your eyes to find waste and then think about how to get rid of the waste you've found. Do this over and over again, always, everywhere, relentlessly and unremittingly" (Hino, 2006). If well-trained, a lean employee can find out problems in any setting. In a sufficiently novel setting, it takes many years of experience to learn how to identify problems and implement lean (Staats et al., 2011). Once a system becomes matured, problems can be identified relatively automatically, but this takes

significant effort over time to gain experience making incremental innovations in the new context (Fujimoto, 1999).

2.3.2 Problem Solving Principles of Lean

Based on different definitions, three basic characteristics of problem-solving can be discerned: it is a form of cognition or thinking (Mayer & Wittrock, 2006); it consists of a process (D'Zurilla & Goldfried, 1971; Atuahene-Gima & Wei, 2011); and it has a beginning and ending (Minztberg et al., 1976; Mayer & Wittrock, 2006).

In the two best-seller world renowned books on lean, named "The Toyota Way: 14 Management Principles from the World's Greatest Manufacturer" by Liker (2005), and "The Toyota Way Fieldbook, A practical Guide for implementing Toyotas 4Ps" by Liker and David Meier published in 2006, the authors have introduced a 4P model of lean: Philosophy; Process; People and partners; and Problem Solving. 14 principles have been proposed for lean where the principle number twelve: "Go and see yourself to thoroughly understand the situation"; the principle number thirteen: "Make decisions slowly by consensus, thoroughly considering all options; implement decisions rapidly"; and the principle number fourteen: "Become a learning organization through relentless reflection and continuous improvement"; have been grouped into the category of problem solving. These principles cover the tenets of continuous improvement and learning (Liker, 2005; Liker & Meier, 2006).

In contrast, Hofmann (2015) pointed out that most leaders working in intricate and dynamic settings realize that they do not have sufficient information to make many of the decisions they face. Hence, they have to engage others in the decision making process who have more specific and relevant information. In other words, these leaders need to lead the decision making process, not actually make the decision. Based on extensive literature review, PSPs of lean at the lowest possible element level are presented below in Table 2.1.

Table 2.1 Elements of Problem Solving Principles of Lean

Sl #	Elements of PSPs	Source(s)
E1	Use Reliable Data	Spear (2004), Liker (2005), Liker & Meier (2006), Vermaak (2008)
E2	Structure Problem Solving Procedure	Liker & Meier (2006), Staats et al. (2011), Marksberry et al. (2011)
E3	Root Causes & Alternative Solutions	Liker (2005), Liker & Meier (2006), Vermaak (2008), Mann, (2010),
E4	Implement Quickly	Spear (2004), Liker (2005), Liker & Meier (2006), Vermaak (2008), Marksberry et al. (2011)
E5	Make Problems Visible	Spear (1999), Liker (2005), Liker & Meier (2006)
E6	Approach Problems Categorically	Spear (2004), Liker & Meier (2006)
E7	Reflect Mistakes & Standardize Processes	Liker (2005), Vermaak (2008), Marksberry et al. (2011)
E8	Encourage Continuous Improvement	Spear (2004), Liker (2005), Liker & Meier (2006), Vermaak (2008)
E9	Best Practices & Strengthening	Liker (2005), Liker & Meier (2006)
E10	Knowledge Protection	Liker (2005), Liker & Meier (2006), Vermaak (2008)

Use Reliable Data: One of lean principles named "genchi genbutsu" means to "go and see" (i.e., to see the problem first hand). Most outside observations about shop-floor or *Gemba* focus is to see the problem first hand. This means that managers do not expect employees to depend on other employee's interpretation of the problem, but to see the problem for themselves. In practice, most employees, under the pressure of correcting processes, hurry up to a countermeasure without grasping the true situation adequately. For this reason, lean emphasizes on understanding the current situation as a dominant theme throughout the training of managers to support and lead problem solving. Lean managers are willing to work with employees even in the early stages of defining the problem (Marksberry et al., 2011).

Spear (2004) advised not to take anything as substitute for direct observation. Liker (2005) added that employees including high-level managers and executives (Vermaak, 2008) need to go to the actual work place to see practically, rather than building up theories on the basis of what other people or the computer screen tell; and use personally verified and proven information and data (Vermaak, 2008). Linking data and information with history at the company's heritage and what has shaped its culture is also important to get reliable data (Liker & Meier, 2006).

Structure Problem Solving Procedure: Staats et al. (2011) emphasized to construct problem solving like scientific experiments in which an overall objective lays out the path for change while specific hypotheses drive the individual changes. To standardize problem solving procedure, top leadership need to agree on the proposed way followed by employees and managers to understand the actual situation (Liker & Meier, 2006).

It is also recommended to delegate without giving away power but protecting the learners from failing and recovering while they choose the wrong path in problem solving. Managers have to assign work in a way that employees hold the ownership of their work but approval of trials to test any idea will remain as manager's responsibility. Managers need to remember that employees will not feel motivated if they can not contribute with their ideas. Again, leaders of each team, group and section should take the responsibility to lead problem solving and support subordinates (Marksberry et al., 2011).

Root Causes and Alternative Solutions: Once a process becomes stable, appropriate tools are required to determine the root cause of undesired outcomes and inefficiencies, and implement effective countermeasures (Liker & Meier, 2006). The aim should be to find the source of problems so they never come out again (Mann, 2010). To collect ideas and get agreement to pick a single direction and go down that one path, most importantly, all problems and all potential alternative solutions must be discussed thoroughly with all of those who are affected by the problems (Liker, 2005). This process to get total agreement is a bit lengthy but helps broaden the solution (Vermaak, 2008).

Implement Quickly: Once picked the solution, move quickly but carefully down the path (Liker, 2005; Vermaak, 2008) and try to implement most countermeasures within the week. Let the overall permanency of the countermeasure define short term and long term. A short-term countermeasure is temporary which provides temporary relief until a more effective or extensive solution can be designed and implemented (Liker & Meier, 2006). Getting mangers involved in the front end of problem solving as facilitator and to recover is mandatory (Marksberry et al., 2011) and they should coach, not fix; and act as enablers (Spear, 2004).

Make Problems Visible: Task specification needs to be facilitated so that workers can recognize problems fast and precisely (Spear, 1999). To ensure that exposing a problem will not get team members in trouble or lead to job loss is critical (Liker & Meier, 2006). Liker (2005) advised to communicate visually on One Piece of Paper (A3 report) to arrive at decisions.

Approach Problems Categorically: Liker and Meier (2006) proposed the elements of evaluating problems to determine which problems need the most immediate consideration: importance, urgency and tendency, and they advised that addressing larger issues are generally directed and controlled through management activities like Management Kaizen Training. (Spear, 2004) advised to develop teams to solve small problems simultaneously so that the line can recover problems fast.

Reflect Mistakes and Standardize Processes: Liker (2005) raised the point to reflect when a project is finished, to openly recognize all the deficiencies of the project, and develop countermeasures to avoid repeating mistakes in future (Vermaak, 2008).

Standardization of the process is critical to problem solving because before raising the standard, the process must be stable first (Vermaak, 2008). Managers are reinforced to teach the standardization side of problem solving. This is also same in industrial engineering that before improving the outcomes, processes have to be predictable, consistent and repeatable. Managers need to encourage employees to learn more about their work areas while establishing work standards to develop stability in their operations (Marksberry et al., 2011).

Encourage Continuous Improvement: Primarily, processes need to be designed that require almost no inventory (Vermaak, 2008), and wasted time and resources are easily visible for all to see and use a continuous improvement process to eliminate them (Liker, 2005). Facilitating improvements with freedom from any rules and provide training, and encouraging every employee to use the problem solving process daily are the important parts of problem solving in lean (Liker & Meier, 2006). Additionally, Spear (2004) advised to focus on as many quick, simple experiments as possible.

Best Practices & Strengthening: Learning by standardizing the best practices (Liker, 2005) across the whole organization, and establishing expectations to identify weak

points in the system and to apply the appropriate resources (Liker & Meier, 2006) are required to strengthen the problem solving process.

Knowledge Protection: When processes are stable, and waste and inefficiencies are widely visible, the opportunity is available to constantly learn, and learning means moving forward by building on the past rather than starting over with each new project and each new manager (Liker & Meier, 2006). So finally, Liker (2005) has strongly recommended developing stable personnel (Vermaak, 2008), promoting people slowly, and setting up succession systems very carefully to protect the organizational knowledge base.

2.4 Success Factors

The lean transformation system is a radical process and not a painless task (Smeds, 1994). Lean represents a holistic approach to change. In order to create the foundation for it to take hold, a significant organizational change must occur in every areas of the organization. In many developing countries, although lean practices have already been applied; the level of perception on its underlined philosophy is quite varying (Mohamad et al., 2013), and the failure is, in Womack's opinion (Hohmann, 2017b) multiple; for example:

1. It is the failure to get large organizations to convert themselves in a lean way and have, at least, "another Toyota" rising.
2. It is the failure to reverse off-shoring, despite the rational evidence that companies would be better-off keeping operations close in lieu of trading labor costs for logistics and quality costs.
3. It is the failure to see distancing among the workers and the rising acceptance of things as they are, without attempt to resist or change them in the lean community itself.

There is no "cookbook" to explain lean process step by step and how exactly to apply the tools and techniques (Allen, 2000). Hence, in reality, not many companies across the globe are successful to implement this system (Ballé, 2005). Some

researchers have suggested that applying the full set of lean principles and tools can contribute to the successful lean transformation (Herron & Braiden, 2007). The next sub-section will discuss about some factors for successful implementation.

2.4.1 Success Factors of Lean Implementation

Lean can be complicated because of all the variables and communication involved. If the first lean project fails to succeed or produces little return on investment; collaboration and support for future projects will fade away (Kilpatrick, 2003). Asefeso (2014) distinguishes that there is a substantial difference between "doing lean" and "being lean". He also comments that many more companies are falling into the trap of "doing lean" while not undertaking the necessary changes to actually "be lean". Task of process improvements using only lean tools runs the risk of following so many other improvement efforts that have fizzled into oblivion after a few years of rigorous effort in the industries.

In fact, lean transformation should be put into practice expansively and holistically in capacity and content (Crute et al., 2003). A fundamental change especially in organizational culture of the company is required in order to ensure a sustainable success in lean manufacturing implementation and reap the dramatic improvement promised. A clear translation of lean philosophy and culture should be done systematically so that the entire workforce in the organization fully understands and accepts lean philosophy.

Sometimes some companies implement the building blocks of lean in the incorrect sequence and things get worse. For example, if batch sizes are reduced in prior to reducing the changeover time when changeover times are lengthy; equipment utilization will go down and the ability to serve customers will be declined. Then a typical reaction to this might be, we tried to implement lean but it does not fit us (Kilpatrick, 2003). Thus, failure to identify required organizational changes along with timing and precedence to adapt lean manufacturing system will hold back the long-term benefits to the organization (Norani et al., 2011).

During a research on SFs of lean in European food processing SMEs, Dora et al. (2013) were surprised to find that skill of the labor force and internal expertise are the

most important factors (Kumar & Antony, 2008). They have also mentioned that the majority of the studies on SFs found that leadership and management are the key factors for lean (Hines et al., 2004). Their result showed that the organizational culture is also an important factor for lean implementation.

Hamid (2011) classified SFs and mentioned eight internal organizational factors such as top management commitment, business planning, employee involvement, training, thinking development, organizational culture, communication and resource allocation. According to his study, almost all the large organizations stated that at the initial stage of lean implementation, the main factor is the workforce knowledge and commitment, but with the gradual growth, and subsequent maturity of lean; commitment of top management appears as more critical for the success.

Nordin et al. (2011) explored the extent of lean manufacturing implementation and examined the factors influencing lean success. His findings revealed that the most influential barriers are the lack of understanding of concepts and shop floor employees' attitude. Roslin et al. (2014) also attempted to mention and discuss to some extent on the key elements that persists in lean management strategy implementation. He had suggested that the continuous management commitment, teamwork and organization-wide involvement are significantly contributing to lean success.

In order to find determinant factors for lean management implementation, Jedynak (2015) did two case studies representing furniture and boating industry in Finland where he referred to Rymaszewska (2014) who has identified some supporting factors for small and medium enterprises for lean implementation: faster communication, unified organizational culture, support to change initiatives etc. Recently, Kumar and Mathiyazhagan (2020) modeled the interrelationship of ten success factors to adopt sustainable lean manufacturing which includes teamwork, IT system etc.

Salonitis & Tsinopoulos (2016) have researched on lean implementation in the Greek manufacturing sector and found the main factors hindering success in emerging economies: lack of quality control, knowledge gap, poor inventory management and poor employee training within social subsystem. They have also mentioned some other barriers related to financial and top management; organisational culture; commitment of

management and from the bottom; providing adequate resources to support change; effective communication; teamwork; timing to set realistic timescales for change; and effective use of commitments and enthusiasm for change (Alefari et al., 2017).

Zhou (2016) has investigated in the companies that have moderate level of lean practices, and found the major challenges are cultural changes and adequate knowledge transfer, followed by the lack of willingness from management etc. Sometimes the concept and philosophy behind lean transformation may lead to shocking changes in an organization's culture especially in the initial phases of implementation process. So organization must ensure in advance that all employees understand lean sufficiently.

Zhou (2016) further argued that after a considerable level of lean transformation, restructuring across the whole organization might be required to further reduce waste and costs. At this stage, resistance to lean can grow up from the thoughts that some positions could be eliminated as they are considered to be the ones that do not add values to the firm. These management or people related factors could pose serious challenges to lean policies. Companies need to create a favorable lean culture that can be shared across the entire organization. Adequate supports and active involvement ranging from higher management to individual employees are all essential to the success of lean implementation. To be engaged in lean practices effectively and extensively, management must have adequate knowledge of a variety of lean concepts, tools, techniques and programs ensuring proper and smooth applications. In his research, major challenges for the lean firms, were also identified. In his list of major challenges, backsliding to the previous ways of working ranked top and followed by company cultural changes, employee resistance, need to incorporate other organizations and inadequate knowledge and know-how. Reverting to the old ways of working was thought as a result that lean initiatives need extra work and responsibilities.

2.4.2 Some Success Factors of Other Relevant Management

Manville et al. (2012) has summarized a list of SFs for lean six sigma (LSS) programmes. Among those factors they listed management participation and promise, cultural change, communication, organisation infrastructure, training, understanding its tools and techniques, project management skills, project prioritization and selection etc. as mentioned by Coronado & Antony (2002). Also, the right selection of people and

projects; communication of direction and potential benefits to ensure moderate commitment; clearly allocated people, time, money and other resources recognition; and reinforcement of desired improvement alternatives and behaviours are mentioned by Snee (1999). Finally, upper management support and participation; organisational infrastructure; training and education etc. are pointed by Henderson and Evans (2000).

Lande et al. (2016) has listed twenty two SFs of LSS for Indian scenario: training; management involvement and commitment; leadership; project prioritization and selection; cultural change; understand LSS methodology; strategic quality planning; linking LSS to customers; inventory control; communication of information; linking LSS to suppliers; quality measurement system or quality data; benchmarking; and role of quality department etc. Lee et al. (2001) suggest eleven SFs for implementation of LSS that represent different measurements of quality and productivity improvement approaches: management knowledge; leadership; strategic quality planning; training; employee involvement, inventory control etc.

Laureani and Antony (2012) analyzed the implementation of LSS at UK and presented the 13 SFs for the effective implementation of LSS: deployment plan, active participation of the senior executives, project reviews, technical support (Master Black Belts), full-time vs. part-time resources, training, communications, project selection, project tracking, incentive program, safe environment, supplier plan, and customer "WOWS". In 2013, Fadly Habidin and Mohd Yusof studied SFs of LSS for the Malaysian automotive industry on the basis of a survey of empirical data on some perspectives: financial, customer, internal business process, and innovation and learning growth.

Kumar et al. (2014) studied SFs of Quality Management (QM) practices in the Australian SMEs and suggest fourteen SFs for QM practices in the Australian SMEs: leadership and management commitment; organisational infrastructure; cultural change; education and training; fact-based decision-making; linking QM practices to customers; linking QM practices to business strategy; linking QM practices to employees; linking QM practices to suppliers; communication; project management skills; project prioritization and selection; usage of innovative techniques and IT systems; networking with government and academia.

Haleem et al. (2012) conducted a brainstorming session with a team of experts from industry and academia participated in and identified ten SFs for world class manufacturing: satisfaction of internal customers; health management of employees; use of information system in total quality management; excellent top management; reductions in energy consumption and waste minimization (industry input); flexible computer-integrated manufacturing systems; adequate and poka-yoke quality; continuous improvements in the process; rewards and incentives (industry input); and responsiveness of supply chain.

2.4.3 Description of Success Factors

Vision and Business Plan: Vision answers the "why" that motivates action. Based on some MIT studies Asefeso (2014) advocates for vision for effective lean implementation. He has found that in the weak firms, change meetings generate only temporary excitement, and people go back to the work with previous level of enthusiasm. Top leadership must have strong vision to reinforce the change management. Mid-level managers need to own their vision. Workgroup needs to focus on few things identified to make the change really stick. A clear business plan to guide the direction of the action is needed (Buckhout et al., 1999).

Organizations should have a business plan with proposed resources, costs, risks, benefits and timeline (Wee, 2000) which helps keep focus on business benefits (Holland et al., 1999), make work easier and impact on work (Rosario, 2000). A clear business model is also required as a guideline for how the organization should operate behind the implementation actions (Holland et al., 1999). There should be a good reason for any investment based on a problem and the change tied directly to the direction of the company benefits as well (Falkowski et al., 1998).

Manageable Goals: Klein and Weitzenfeld (1978) in their work on ill-defined problem solving proposed that the properties of the goal should be identified along with the procedures for accomplishing it. The goals have to be "reasonable", not "perfect". If the goals are too tight, the employees associated will be demoralized; on the other hand, if too loose they will not work hard enough. Goals need to be set honestly and circulated as a current reference, and quite changeable as per experiences gained. Specially, the production goal is desired to adjust after monitoring actual output over

time (Asefeso, 2014). Salonitis and Tsinopoulos (2016) have strongly advised to treat goals as commitments only, not the deadlines and targets. Mitchell and Walinga (2017) suggest that a problem frame that expands to include both values and barriers will provoke more systemic and sustainable solutions.

Organizational Structure: According to the researcher Faron (2012), successfully transformed lean companies have observed that organization structure is one of the SFs of lean implementation. A good number of researchers on lean management have confirmed that flexible and flat organization structure is very suitable for lean management. As stated by Pugh et al. (1963) and mentioned by Siemerink (2014), organization structure consists of four basic dimensions: structure of activities, concentration of authority, control of workflow and size of supportive component.

Human Resource Empowerment: "Human resource is an important asset of any organization" (Doustar et al., 2014). To get better results, Audenaert & Decramer (2016) suggest sharing power and providing impact to employees to pass control to them. When employees feel in charge to exercise influence, they perform creatively. Empowering leaders also encourage critical thinking to explore ideas and develop alternative approaches of working (Ahearne et al., 2005). By training and empowering human resource, organization can explore its ability to succeed in lean implementation (Doustar et al., 2014). According to Jurado et al. (2013), when the opinions of employees are listened with importance, and proposals are considered and implemented they become motivated which helps the lean transformation in a longer run.

Compelling Need to Change: People mostly need a reason to change to buy into it and make it successful. So it is better for management to create a reason to necessitate the change rather than waiting until something happens to be serious enough. As an alternative, to prevent the question of necessity of change is being asked, the benefits out of it for everyone could be highlighted. It is not difficult to develop a need to change in this economically challenging environment (Asefeso, 2014).

Leadership from Top Management: Top management has to dedicate time to reviewing plans, following up on results and facilitating management problems (Young & Jordan, 2008) where top management consists of Director, Chief executive officer of the organization. According to Achanga et al. (2006), an exceptional leadership along

with top management involvement plays a vital role to push the lean implementation forward. Some other authors also emphasized on the "evidence of management commitment" for the success of lean implementation (Baviskar, 2015; Kundu & Manohar, 2012).

It is the top management who needs to declare the project's priority clearly and publicly (Wee, 2000), to be committed with involvement and willingness to allocate valuable resources (Holland et al., 1999). Also policies should be set by them to establish new systems; and in case of any conflicts, they should mediate between the parties (Roberts & Barrar, 1992). Hofmann (2015) added that it is also the leaders' responsibility to clarify problems, remind objectives to keep the group focused on the true problem and required solutions. Sometimes it is difficult to articulate the problems clearly at the beginning.

Also, it is the role of management to deal with the problems affecting knowledge creation and capability development (Choo et al., 2015). Leaders have to create such an environment that workers consider problems as opportunities to enhance their abilities (De Treville & Antonakis, 2006). Furthermore, leaders should have enough situational awareness to identify and understand the relevant situational variables timely and to formulate a problem correctly (Rahim et al., 2018).

In order to implement lean successfully, the companies should manage strong leadership qualities competent of exhibiting good project management styles. These qualities would facilitate the integration of all infrastructures within an organisation, and these qualities inculcate a vision and strategy for generating value, while permitting a flexible organizational structure. Good leadership ultimately fosters effective skills and knowledge enhancement amongst its workforce (Achanga et al., 2006).

Moreover, if an organisation utilizes multiple projects, leadership functions would have an impact on the speed of problem solving by creating team atmosphere and facilitating multiple team memberships (Furukawa, 2016). Kirton (2004) stated that now a days key problems have become so complex, the time scales for solutions so short, and the demand for implementations so polished that no single person can dominate this process. Problem solving leaders need more than specialized knowledge

and experience about the core problem and possible solutions. They need knowledge and skill in managing and inspiring diverse problem solvers (Michael, 2018).

Financial Capabilities: Financial capacity is the central factor in the grit of any successful mission like lean. Because the costs of useful provisions like consultancy and training are covered by finance. Again, sometimes operations are stopped temporarily when the workforce takes training that companies view as a waste of resources, especially if there is no anticipated immediate returns. Availability of funds for capital investment and strength of financial management are important to run the improvement program of lean (Achanga et al., 2006).

Organizational Culture: Schein Edgar (1984) has elaborated culture in different aspect, and given formal definition as, "The pattern of basic assumptions that a given group has invented, discovered or developed in learning to cope with its problems of external adaptation and internal integration." Researchers Bortolotti et al. (2015) have shown that in successful lean plants management has emphasized on soft lean practices of organizational culture: "concerned of people and relations involving of small group task solving, providing training for resolving various tasks, more customer involvement, continuous improvement and supplier partnerships".

High-performing companies have a culture of sustainable and proactive improvement. According to Achanga et al. (2006), it is clear that communication skills, long-term focus and strategic team are highly advantageous for implementing any new initiative and regardless of cultural models most large organisations are conscious of this. The organizational culture includes; management ability to operate in diverse environment and easy acceptance of changes. These culture changes can occur when senior leaders recruit middle managers to champion the change.

Increasingly within today's organizations, the focus on identifying problems and developing solutions sets in motion a dysfunctional organizational culture for many decisions that impact the organization in very significant ways. One way this type of culture can slow down cross-functional decision making is by reproducing an opinion culture where employees are expected to have to-the-point opinions in about every possible situation. As a result decision making is slow and sometimes it even builds a very tempting foundation to mislead the process precisely. If there is a group of people

gathered together who all have opinions, then a logical place to start is by engaging the various stakeholders around the table. This seems like a very up-to-date, ‘‘progressive’’ leadership strategy. The top-down, autocratic decision making is seen as out of trend and particularly, ill-suited for dealing with the current complex and dynamic environments (Hofmann, 2015).

Organizations need to create impressive cultures to encourage individuals to take part in problem solving meetings with their own ideas for solution. Then this culture becomes strengthened and evident as effective and efficient for many kinds of small, tactical and execution focused problems. Individuals further reinforce this culture by managing these expectations for their subordinates and by their managers. Eventually, many of these individuals move into leading positions to solve more complex problems in cross-functional groups (Hofmann, 2015).

Total Commitment to Theories, Concepts & Tools: Everyone in the whole organization should be committed to theories, concepts and tools of lean transformation, and this criterion should be considered as the most significant key to successful implementation. For example, if the finance team is still using standard cost accounting, no one will see the financial gain of implementing lean. If finance has no desire to change, the executive level must step in and drive change (Asefeso, 2014). It requires complete and total commitment starting from the top management to all departments at all levels of the organization. Lean has thorough impacts on every employee in business, and the change in the organizational culture causes so much discomfort that many companies find it very difficult to adjust with its magnitude (Kilpatrick, 2003).

Resistance to Change: Resistance to lean is not unexpected as many companies have misused the approach significantly. This force back creates barriers for the necessary changes during lean implementation. Moreover, a good number of skeptical staffs consider the initiative as just another flavour-of-the-month that will eventually discontinue. Many businesses struggle to overcome this barrier (Asefeso, 2014). Businesses committing to lean transformation should take care of both the physical and mental health of the staff. If the time benefit gained from lean is used as an opportunity to pile more work onto employees, it will result in only low productivity, and employee morale. Asefeso (2014) also recommends that taking the time to work with the

employee, learning to identify necessary tasks, removing unnecessary work and discovering more available time to do more valuable work (without increasing the overall workload) will result in better understanding among employees, more trust, efficient communication, and overall employee performance. After a considerable level of lean implementation, organization wide restructuring is required for further improvement. The resistance can also arise when employees start thinking that some positions are adding no value anymore and could be eliminated anytime (Zhou, 2016).

Resources Allocation: Lean can not be implemented without necessary resources to support the change. To drive and manage implementation as a clear and real strategic initiative, adequate resources need to be provided to support change as per strategy. Hence resources allocation is a SF mentioned by many authors (Achanga et al., 2006; Vermaak, 2008; Marodin & Aurin, 2015; Salonitis & Tsinopoulos, 2016; Alefari et al., 2017). Many companies rely on consultants for introducing lean. In that case, the knowledge and experience of the consultant are important. Shallow knowledge on lean and lack of implementation practice results will create confusion about lean and eventually, act as a barrier for successful implementation (Singh & Singh, 2016).

Timing to Change: Quick improvements usually do not sustain as people habitually go back to their previous ways of doing work shortly after the improvements are made. Appropriate timing is often missed and as a result organizations fail to succeed (Asefeso, 2014). Realistic Timeline along with roadmap for change helps to make better use of commitments and enthusiasm and thus it plays an important role for lean implementation (Salonitis & Tsinopoulos, 2016).

Project Management: An individual or group of people should be given responsibility to drive success in lean implementation projects (Rosario, 2000). But the project management should be closely and actively controlled with coordinated training by the human resource department (Falkowski et al., 1998). It should also include the planning of well-defined tasks and estimation of required resources. Project manager needs to resolve issues and conflicts from time to time (Rosario, 2000).

Delivering early measures of success with rapid, successive and contained deliverables is critical for implementation momentum. A focus on results and constant

tracking of schedules and budgets against targets will help to progress smoothly (Wee, 2000). Project sponsor should remain committed to act over the entire life cycle of the lean project (Rosario, 2000). Also, a high level executive sponsor is required with the power to set goals and legitimize change (Falkowski et al., 1998). The business leader should hold the business perspective and continually strive to manage resistance while the project leader should manage the project across the whole organization as "Champion" (Sumner, 1999).

Engagement of Process Owners: Usually, process owners know most about a process as they do it each and every day. Therefore, they are the best candidates to be utilized more and to be provided empowerment to make the changes. To engage them organizations may need to arrange workshops with worker and employee representatives from each step of the Value Stream. In the best companies, it is always safe to make a mistake, as long as the employee owns the mistake and learn from it (Liker & Meyer, 2006).

Staats et al. (2011) describes hypothesis-driven problem solving in lean. It engages the process owners and tests the hypothesis at the lowest level to lift the organization gradually towards the ideal. This method of problem solving is structured like scientific experiments: an overall objective guides the program for change while specific hypotheses drive the individual changes.

One of the eight wastes to eliminate in lean is the under-utilized employees who have the potential to come up with great ideas and best solutions. Hence engaging and empowering them to improve their work standards and practices continuously should be considered as an important factor for lean implementation (Asefeso, 2014).

Knowledge and Mindset: Lean as a new knowledge to employees (before its implementation) requires open-minded and knowledgeable employees. Any improvement process is an unknown journey. But splitting an abstract vision into a series of conditions will help to achieve the target conditions using the creative powers of people. But it requires teaching employees a standardized way of grasping the fundamental nature of situations, and responding systematically (Byfuglien et al., 2013).

Organizational learning lifts up the discussion of problem solving to the firm level of analysis (Bontis et al., 2002). Learning by problem solving is a vital strategic capability and it is a self-motivated action (Teece et al., 1997). Also, organization understands its environment better and increases its absorptive capacity through problem solving activities (Gray & Chan, 2000). Successful firms not only learn through problem solving but also transform new ideas faster than their competitors (Giampaoli et al., 2017).

John Ni and Xiaowen Huang (2018), based on their research titled "Discovery-to-recall in the automotive industry: a problem solving viewpoint on investigation of quality failure" found that the location of knowledge extensively impacts the problem structure and complexity. Marksberry et al. (2011) added that a common theme in problem solving frameworks is ordered thinking for processing information which is necessary in learning and knowledge transfer.

Again, organisations depend on teamwork to execute business issues, so knowledge integration within teams are also important (Huang & Newell, 2003). Furukawa (2016) suggested that creativity requires integrating diverse knowledge at multi-level of organisational structure. To develop good habits for hands-on problem solving, the mentor should not disclose an idea of solving the problem. The mentor should just give the trainee a challenge and lead via intensive questioning-based coaching (Liker & Rother, 2011) to develop the required mind-set for lean management.

Skills and Expertise: The result of any improvement initiative depends on the use of intelligence and innovation capability of employees. If people with low skills levels are engaged who are not interested in skill enhancement, they may derail the central idea of lean implementation strategy. Moreover, low skilled employee does not possess the desire for technology development (Achanga et al., 2006). Therefore, researchers commented that skills and expertise criterion is a critical SF (Achanga et al., 2006; Zhou et al., 2016).

Utilize Technology: Information Technology (IT) is been continuously used in manufacturing industries for process modeling, information management system and product scheduling and controlling. IT can be used to automate existing process, where

the existing manual process put in to a system to automate the process. The other area is where IT is a pacesetter, which is, where it comes with new methodology and dictates the process. Many organizations have placed customer relationship management (CRM) systems online as part of their website. A customer can log in and create a trouble ticket online for a support or service request in stead of talking to a customer support representative on the telephone. Many organizations are using self-service frequently asked questions (FAQ) sections on their websites where customers can see if their problem has been faced by other customers, and what the solution was, in those cases. Business process management systems (BPMS) enable streamline and integrate different software systems that may be involved in a business process. By providing a overall framework for the business process, BPMS systems enable smooth flow of business s processes across different departments, functions and backend software systems. The service-oriented architectures (SOA) technology enables software systems in the same or disparate organizations talk to each other and exchange information automatically, without any human intervention (Mehta et al., 2012)

In lean assessment, assessment data is stored and managed by the organization's management information system (MIS). Thus IT plays an important role in integration of lean assessment tools. It also comes handy for analyzing data to interpret and to use in both current and future state of value stream map of the company. Thus technology helps organizations to identify gaps for improvements (Nightingale, 2000).

Attitudes and Behaviours: Senior leadership commitment and role modeling require behaviours. Management should exert enough focus for supporting lean initiatives, create urgency, have long term vision etc. (Singh & Singh, 2016). The effectiveness of the manager reflects in other employees not only in the shop floor or the workshops but also in the office. To introduce lean successfully generally require managers to 'Go and See' the work taking place, to fix problems where they occur rather than from behind a desk. It is the core responsibility of the management to have all other employees practicing a specific behaviour pattern to achieve the goals and objectives of the improvement initiatives (Asefeso, 2014). Kumar et al. (2017) found that unexpected problems, conflicts, and disagreements are usual in a relationship. To deal with such problems and to promote appropriate behaviours, problem solving and performance measurement are very important dimensions in collaborative relationship.

Effective leaders do not let their direct reports bring problems; leaders make sure they bring solutions. For direct reports who are working to establish credibility with both their managers and peers, this is great insight. Clearly, it is credibility enhancing to be viewed as someone who proactively analyzes and develops solutions to problems. Managers want their employees to be proactive, considerate and efficient with their time (Hofmann, 2015).

Understanding the Process: Knowing a lot about something does not guarantee the real understanding of it. If the person who knows the process can go and fix the process to make the product or complete the service, the understanding of the process becomes evident. For example, one of the biggest mistakes about trying to get better quality is trying to improve quality in the product itself by analyzing the product only. That is the wrong approach. It is required to go and fix the process to make the product or complete the service, and as the process improves, quality improves (Asefeso, 2014).

Even when the concepts and tools of lean are made quite clear, there is a possibility to plan them in wrong sequence, and it will affect the organization negatively. The way of teaching lean in training hall through workbooks is at a point of diminishing returns (Womack, 2017).

Create Internal Consultant: In many cases where lean fails once the consultants leave, is due to knowledge being pushed instead of pulled. In many hierarchical organizations, even when managers agree to try and implement lean they are rarely taught how to pull it from their people. A good consultant might be able to pull lean out of managers but too infrequently. Where pushing some tools, techniques and knowledge is much more common and ultimately succeeds to improve in the short term but fails to transform an organization in the long term by not putting it on a path of continuous improvement at all levels (Womack, 2017). Vermaak (2008) has emphasized on appointing line managers who are subject-matter expert internal consultants. They need to assist to implement various lean tools and develop the lean topics continuously.

Effective Communication: In communication, understanding by both parties should be ensured by communicating often, and communicating effectively so that everyone is on the same page and has the same team spirit. Inputs from the team

members should be managed to know their requirements and reactions to approve accordingly (Rosario, 2000).

Management of communication is critical for successful lean implementation (Wee, 2000). If people fail to understand and communicate e.g. urgency of lean transformation change process may move towards ultimate failure (Jurado et al., 2013). The flow of information is expected from top management to the bottom but middle managers also need to communicate (Wee, 2000) the scope, objectives, activities and updates to all the employees as early as possible (Sumner, 1999). Communication is necessary for understanding the need for change for executing any new tools like lean assessment. Specially, the continuous circulation of benefits of lean will reduce the resistance from the people (Jurado et al., 2013). Expectations at every level need to be communicated as well (Wee, 2000). Campaign, the lean story board etc. can be used to promote project teams and to advertise project progress of lean implementation (Holland et al., 1999).

Teamwork: Team can achieve results that are impossible to achieve individually (Asefeso, 2014). But the understanding of team members' behaviours such as cross-understanding is required for high efficiency from team (Furukawa, 2016). Internal quality department functions who work closely with the customer and update the corrective action, mostly led the problem solving activities (Marksberry et al., 2011). Most quality engineers and managers are highly motivated to their activities as they want to pass inclusive information to the customer (Yoes, 1998).

Team members are encouraged to lead problem solving in quality circles, but the participation may be limited to only an hour per week (Marksberry et al., 2011). A more direct approach is to assign problem solving responsibility to a supervisor, coordinator or manager in functional areas (Yoes, 1998). Again, the environment including the team structure is critical to the team's engagement and performance (Tongo, 2015). Therefore, managers need to structure the teams based on team dynamics to enhance problem solving across team members (Herath et al., 2017).

Sumner (1999) has suggested mixing consultants and internal staff in a team so that the internal staff can develop the necessary technical skills for lean implementation. In fact, both business and technical knowledge are essential for

success (Sumner, 1999). If the team is familiar with the business functions and products or service, they can make decisions to support major business processes (Rosario, 2000). Wee (2000) has proposed to give incentives to the teams that successfully completed the projects on time and within budget.

Right Kind of Training: Absence of right knowledge on lean philosophy and the various tools create fears in employees' mind, and the fear of the unknown (Singh & Singh, 2016) is responsible for the struggle to change by them (Vermaak, 2008) which lead to fear of failure and complacency. So the right kind of training for lean implementation is important to prevent lean failure. Asefeso (2014) has advised to choose the instructors for training carefully. The instructors should have the knowledge on right kind of tools that best fit for the organization and the experience to implement lean in a good way.

Downtime Management: For standardization, the process needs to be stable. If the line and equipment are reliable, downtime will be minimal, especially most applicable in case of machining operations where changeover times must be considered. Consider the cycle time of the equipment, that is, how long it takes to process each piece, but also factor in planned downtime during tool changes and changeover times where changeover times are significant. Standardization also helps identifying bottleneck operations (Liker & Meier, 2006).

Implementing down time does not mean allowing employees to sit and gossip during slow periods. Implementing down time is implementing a process that employees can follow during downtime because with any kind of production work there is going to be down time, whether the machines need to get moved or the machine breaks down. In case of any down time whether planned or not, there should be some options of other work for employees to do. For example, if a machine shuts down unexpectedly employees can spend time by cleaning up their work area. Scheduling downtime reduces the chance of unscheduled downtime and saves money (Asefeso, 2014).

Metrics and Accountability: In addition to finding a correlation between relative performance and what metrics were used, Aberdeen Group (2006) reported that success of lean is also depends on how frequently organizations measure standard performance

on the task. The ability to measure is thus critical. Approximately 30% of the best-in-class organisations measure results daily and some are starting the use of real-time technologies for this purpose. But only 3% of laggard organisations measure results frequently and 45% measure on an ad hoc basis. Womack & Jones (2003) emphasized on a scoreboard showing real time happenings to everyone in the value stream.

According to the Kaufman Global Group (2003), a customer-focused, consistent, and understandable set of metrics are necessary to drive improvement efforts, and the metrics must be developed at each level of the organisation with alignment to support the overall goals of business improvement. Process management and standard work are critical elements in establishing and sustaining useful and relevant metrics. All metrics must be understandable by everyone involved, and micro-process metrics should be linked to the long-term goals (lead-time reductions, yield improvements, inventory turns, increase in sales, flow days, and so on) and readily evident. The linkages supported by the financial reporting structures (percent improvement converted to a monetary measure), will show visible results at the bottom line. Also, by communicating in the same language as management, the implementation team will easily get the support needed to continue the hard work (Kilpatrick, 2003).

Keep Track of Progress: Keeping track of the progress is an important factor because without measurement everything's arguable. Beginning with small steps and continuing to build on them, the progress should be monitored dynamically as per set roadmap, milestones and targets. According to Roberts and Barrar (1992), two types of criteria may be used: project management based criteria which includes dates, costs and quality; and some operational criteria for the production system.

Monitoring and feedback include the exchange of information between the project team members and analysis of user feedback (Holland et al., 1999). Reporting should be emphasized with custom report development and user training in reporting applications (Sumner, 1999). An early reporting of progressive success is recommended to manage skepticism (Rosario, 2000).

Extend beyond Production and to Suppliers: Beyond manufacturing, lean does affect research, design, finance, purchasing, sales, customer service etc. Failure to understand the effect of manufacturing improvements on other areas can result in

overall failure. For example, saying if the manufacturing team reduces processing time from five days to one day, but "pre-production" team still remains at 25 days to get the order to manufacturing, the ultimate gain is not that much on the competition (Asefeso, 2014).

According to Liker and Meier (2006), lean is about connected flows between stable processes across the whole supply chain. Suppliers are simply extensions of the assembly line, and waste anyplace in the value stream from raw materials to delivery to the customer is still waste. Having suppliers who do not have capability to eliminate waste creates weak links throughout the value chain. Hence partnership with suppliers expands the opportunity of more efficient problem-solving activities for the management (von Hippel, 1994; Jensen & Szulanski, 2004).

Kilpatrick (2003) advised companies to attach suppliers for lean implementation to get just-in-time delivery of high quality materials. If critical suppliers fail the delivery date, and the required quantities, the benefits of Lean will be greatly lost. The development of a lean supply chain is probably one of the most difficult, but more financially rewarding, aspects of implementing Lean. Again, in this age of technologically turbulence, in particular, collaboration with suppliers creates a space of more efficient problem-solving activities for the management (von Hippel, 1994; Jensen & Szulanski, 2004).

Manage Reactions: Action of changes creates reactions. When the technical 'arrangements' or facilities of a system are changed; the nature of the social interactions among employees and the reactions to the technical change also change (Bollbach, 2012). It is difficult to understand the reaction, to prepare for it and to work with it. Failure to understand how a Lean transformation is related with the entire business will surprisingly affect the result. From different journeys and experiences with companies, Asefeso (2014) has expressed his doubts that people still have had a fundamental misunderstanding of what the TPS is in practice.

Motivation: Lean manufacturing failure happens when employees do not engage themselves with their fullest capacity. To avoid this kind of situation, organizations need to keep our employees motivated and happy. Providing better pay and benefits are not enough to grow exceptional people (Liker & Meier, 2006). The workforce should

be provided enough knowledge about lean along with motivation so that they understand and accept the challenges. Commitment of senior management is not enough if they have many other pressures.

Asefeso (2014) has suggested offering rewards like bonuses or raises for exceptional achievements of certain goals. But Liker and Meier (2006) disagreed that throwing all kinds of bonuses at people may not always create the proper environment for them to flourish. They also argued that automation is not a solution. Because saving local cost through automation may affect the motivation negatively in the long term.

Supplier performance: Salonitis & Tsinopoulos (2016) have researched on Lean implementation in the Greek manufacturing sector and found weak supplier performance as one of the main barriers in emerging economies. A. K. Singh and M. P. Sing (2016) have found that supplier willingness to change and support for product variety are important for success of lean implementation. Suppliers always play a key role in cost factor. So supplier performance is an important SF for lean.

Business Strategy: Lean transition requires major changes in many areas of the company (Narang, 2008). Smeds (1994) has done an analysis on how to manage the change towards a lean enterprise and pointed that lean transition requires emergent strategy which emerges when the environment of the organization becomes recognized and legitimized. Other researchers also emphasized on clear definition of strategy of improvement efforts (Manville et al., 2012) and linking the improvement program to business strategy (Lande et al. 2016) for successful lean implementation.

Detailed Implementation plan: It is very challenging for lean implementation in organizations that the change journey is guided as per the detailed implementation plan. This is because lean manufacturing requires change in structure, system, process and employee behaviour (Narang, 2008). Failure to recognize the required organizational changes to adapt lean manufacturing system will hinder the long-term benefits to the organization (Norani et al., 2011).

Apply the full set of lean principles and tools: Many researchers have confirmed that there is no “cookbook” which provides the explanation of the lean transformation process in steps and how exactly to apply the tools and techniques (Allen, 2000).

Researchers have suggested that applying the full set of lean principles and tools can contribute to the successful lean transformation (Herron & Braiden, 2007).

The Table 2.2 is presented for the list of potential SFs for PSPs of lean along with their sources:

Table 2.2 List of Potential SFs for PSPs of Lean

Sl.	SF	Sources
F1	Vision and business plan	Falkowski et al. (1998), Holland et al. (1999), Buckhout et al. (1999), Wee (2000), Rosario (2000), Hamid (2011), Asefeso (2014)
F2	Manageable goals	Klein & Weitzenfeld (1978), Coronado & Antony (2002), Manville et al. (2012), Asefeso (2014), Salonitis & Tsinopoulos (2016)
F3	Organizational structure	Pugh et al. (1968), Faron (2012), Siemerink (2014)
F4	Human resource empowerment	Ahearne et al., (2005), Jurado et al. (2013), Doustar et al., (2014)
F5	Compelling need to change	Asefeso (2014), Salonitis & Tsinopoulos (2016), Alefari et al. (2017)
F6	Leadership from top management	Roberts & Barrar (1992), Holland et al. (1999), Henderson & Evans (2000), Wee (2000), Lee et al. (2001), Coronado & Antony (2002), Hines et al. (2004); Achanga et al. (2006), Hamid (2011), Manville et al. (2012), Kundu & Manohar (2012), Dora et al. (2013), Hofmann (2015), Baviskar (2015), Salonitis & Tsinopoulos (2016), Lande et al. (2016), Zhou (2016)
F7	Financial capabilities	Achanga et al. (2006), Salonitis & Tsinopoulos (2016)
F8	Organizational culture	Coronado & Antony (2002), Achanga et al. (2006), Hamid (2011), Manville et al. (2012), Dora et al. (2013), Rymaszewska (2014), Jedynak (2015), Bortolotti et al. (2015), Hofmann (2015), Salonitis & Tsinopoulos (2016), Zhou (2016), Lande et al. (2016), Alefari et al. (2017)
F9	Total commitment to theories & tools	Snee (1999), Coronado & Antony (2002), Kilpatrick (2003), Hamid (2011), Manville et al. (2012), Roslin et al. (2014), Asefeso (2014), Salonitis & Tsinopoulos (2016), Alefari et al. (2017)
F10	Resistance to change	Asefeso (2014), Zhou (2016)
F11	Resources allocation	Singh & Singh (2016), Snee (1999), Achanga et al. (2006), Vermaak (2008), Hamid (2011), Manville et al. (2012), Marodin & Aurin (2015), Salonitis & Tsinopoulos (2016), Alefari et al. (2017)

Table 2.2 Continued

Sl.	SF	Sources
F12	Timing for change	Asefeso (2014), Salonitis & Tsinopoulos (2016)
F13	Project management	Falkowski et al. (1998), Snee (1999), Sumner (1999), Rosario (2000), Wee (2000), Coronado & Antony (2002), Manville et al. (2012), Lande et al. (2016)
F14	Engagement of Process Owners	Lee et al. (2001), Staats et al. (2011), Coronado & Antony (2002), Manville et al. (2012), Asefeso (2014), Roslin et al. (2014)
F15	Knowledge and Mindset	Lee et al. (2001), Huang & Newell (2003), Liker & Rother (2011), Nordin et al. (2011), Hamid (2011), Byfuglien et al. (2013), Furukawa (2016), Zhou (2016), Lande et al., 2016), Salonitis & Tsinopoulos (2016)
F16	Skills and expertise	Achanga et al. (2006), Kumar & Antony (2008), Dora et al. (2013), Zhou (2016)
F17	Utilize Technology	Nightingale (2000), Mehta et al. (2012), Kumar and Mathiyazhagan (2020)
F18	Attitudes and behaviours	Singh & Singh (2016), Snee (1999), Nordin et al. (2011), Manville et al. (2012), Asefeso (2014), Kumar et al. (2017), Hoffman (2015)
F19	Understand the process	Asefeso (2014), Womack (2017)
F20	Create internal	Vermaak (2008), Womack (2017)
F21	Effective communication	Snee (1999), Holland et al. (1999), Wee (2000), Coronado & Antony (2002), Sumner Hamid (2011), Manville et al. (2012), Jurado et al. (2013), Rymaszewska (2014), Jedynak (2015), Lande et al. (2016), Salonitis & Tsinopoulos (2016), Alefari et al. (2017)
F22	Teamwork	Sumner (1999), Rosario (2000), Wee (2000), Asefeso (2014), Roslin et al. (2014), Furukawa (2016), Salonitis & Tsinopoulos (2016), Alefari et al. (2017), Kumar and Mathiyazhagan (2020)
F23	Right kind of training	Singh & Singh (2016), Henderson & Evans (2000), Lee et al. (2001), Coronado & Antony (2002), Vermaak (2008), Hamid (2011), Manville et al. (2012), Asefeso (2014), Salonitis & Tsinopoulos (2016), Lande et al. (2016)
F24	Downtime management	Liker & Meier (2006), Asefeso (2014)
F25	Metrics and accountability	Kilpatrick (2003), Kaufman Global Group (2003), Womack & Jones (2003), Aberdeen Group (2006)
F26	Keep track of progress	Roberts and Barrar (1992), Holland et al. (1999), Sumner (1999), Rosario (2000)
F27	Extend beyond production & to suppliers	von Hippel (1994), Kilpatrick (2003), Jensen & Szulanski (2004), Liker & Meier (2006), Asefeso (2014), Lande et al. (2016)

Table 2.2 Continued

Sl.	SF	Sources
F28	Manage reactions	Bollbach (2012), Asefeso (2014),
F29	Motivation	Liker & Meier (2006), Haleem et al. (2012), Asefeso (2014)
F30	Suppliers performance	Singh & Singh (2016), Salonitis & Tsinopoulos (2016)
F31	Business strategy	Smeds (1994), Coronado & Antony (2002), Manville et al. (2012), Lande et al. (2016)
F32	Detailed Implementation plan	Narang (2008), Norani et al. (2011)
F33	Apply the full set of lean principles and tools	Allen (2000), Herron & Braiden (2007)
F34	Quality awareness and management	Lee et al. (2001), Salonitis & Tsinopoulos (2016), Lande et al. (2016)
F35	Inventory control	Lee et al. (2001), Lande et al. (2016), Salonitis & Tsinopoulos (2016)
F36	Organizational infrastructure	Henderson & Evans (2000), Coronado & Antony (2002), Manville et al. (2012)

2.5 Success Factors Analysis in Previous Studies

Yin (1989) points out that data analysis consists of a number of stages, i.e. examining, categorizing and tabulating or otherwise recombining the evidence, in order to address the initial goal of a study. Researchers suggest that the purpose should drive the analysis; they believe that 'analysis begins by going back to the intention of the study and survival requires a clear fix on the purpose of the study'. This concept is very helpful to manage data, make sense of what is going on, get rid of extra and irrelevant information and travel safely through the maze of large and complicated paths of information (Rabiee, 2004).

Many problems arise in analyzing qualitative data in general. In particular, focus-groups generate large amounts of data, which tend to overwhelm both novice and experts. A one hour meeting could take 5-6 hours to transcribe in full, leading to many pages of transcripts. Thus, a central aim of data analysis, according to Robson (1993), is to reduce data.

2.5.1 Statistical Analysis vs. MCDM

Researchers who study social science topics usually depend on statistics as a major analytical tool and seek to generalize from sample data collected from a population (Nardi, 2018). The fundamental assumptions of the statistical approach, such as the assumed probabilistic distributions of data sets and the independence of variables, are unrealistic and unsuitable for certain real-world problems with complex and interrelated variables, attributes, and criteria (Liou & Tzeng 2012). But multi criteria decision making (MCDM) studies are often aimed at solving a predefined problem; therefore, more emphasis is placed on constructing models that may be close to decision makers' (DMs') preferences, and yield ideal or satisfactory guidance for decisions. In statistical methods and models, such as regressions, the effect of random errors is assumed to be generated independently from a normal distribution with zero mean and a specific variation. But the assumption for the probabilistic distribution of the effect of random errors is neither identifiable nor examinable (Berk & Freeman, 2003); however, it has certain effects on the obtained regression model (Tzeng & Shen, 2017). As this study is about real-world industrial issues and the success factors are interrelated, MCDM seems more suitable to be applied.

Also, a research project based on statistics attempts to generalize its models to support its hypotheses and theories; consequently, such projects must collect data samples that are sufficiently large to be representative for the assumed population, which can only provide averaged numbers (Spronk et al., 2005) from the sample data. Such averaged results can describe or explain the relationships among the explanatory and response variables. By contrast, MCDM studies often address a predefined case in which DMs attempt to select the optimal decision (ranking or resource allocation). MCDM approach also avoids questionable probabilistic assumptions and seeks to solve problems. Again, the statistical approach tends to collect questionnaires from all available employees or shareholders to determine the average opinion, but the MCDM approach would query the preferences, knowledge, and experience of the managers of the company to devise an optimal strategy. Thus, the statistical approach puts more emphasis on examining the relationships among the variables for theoretical purposes, whereas the MCDM approach focuses on supporting DMs who must solve complicated decision problems in practice (Tzeng & Shen, 2017). As this study is about ranking SFs

based on experts' judgment, MCDM is preferable to statistical analysis tools and models.

Following Hwang and Yoon (1981), MCDM problems can be further categorized into two subfields: multiple attribute decision-making (MADM) and multiple objective decision-making (MODM). MADM is concerned with ranking or selecting by evaluating predetermined alternatives, and MODM is aimed at identifying the optimal outcome by searching for an efficient frontier within a solution space under the given constraints. Most conventional MCDM research comprises these two subfields of MADM and MODM (Köksalan et al., 2011). MADM methods are mainly devised for evaluations. By contrast, MODM is more suitable for designing or planning by optimizing the allocation of limited resources. Hence MADM has been chosen for this study.

2.5.2 Interaction Analysis by DEMATEL

Sivakumar et al. (2018) stated that criteria interaction is mainly of two types, namely, criteria dependency and criteria interactivity. Criteria dependency is subdivided into three types, namely, structural dependency, causal dependency and preferential dependency. In causal dependency, cause and effect relationships between factors are identified, and the statistical results are drawn (Sivakumar et al., 2018). There are about seven important techniques under causal dependency (Gölcük & Baykasoğlu, 2016). These are causal maps (Rodrigues et al., 2017), DEMATEL (Wu & Lee, 2007; Patil & Kant, 2013), fuzzy cognitive maps (Salmeron et al., 2012; Ferreira et al., 2017), Bayesian networks (Zeng et al., 2016; Marvin et al., 2017), system dynamics (Xu & Coors, 2012), ISM (Purohit et al., 2016; Girubha et al., 2016; Agi & Nishant, 2017) and structural equation modeling (Bagozzi, 2010; Hair et al., 2012).

Causal maps (Rodrigues et al., 2017) involve elements or nodes which display causal relationships of different factors using positive or negative loading of various strengths indicated with numbers ranging from zero to five. The DEMATEL method transforms the inter-relationship among causes and the effects of factors and provides a structural framework for the system (Wu & Lee, 2007). Recently, for a similar study to analyze the interrelationship of critical success factors for sustainable lean manufacturing adoption in Indian industries, Naveen Kumar and K. Mathiyazhagan has

used DEMATEL successfully (Kumar & Mathiyazhagan, 2020). The fuzzy cognitive map is a combination of cognitive mapping and fuzzy logic (Salmeron et al., 2012) which gives a graphical representation of the given system. Bayesian networks are graphical models representing information related to an uncertain domain (Zeng et al., 2016). ISM (Purohit et al., 2016) is used for identifying relationships between factors and defining problems. System dynamics dynamically defines problems by different stages of modeling and mapping (Xu & Coors, 2012) and helps to understand complex problems. Structural equation modeling (Bagozzi, 2010) defines the structural relationship between factors and provides statistical results. In this research work, the DEMATEL method is used for analysis. The reasons for adopting this methodology are as follows:

1. The DEMATEL method is relatively flexible (Bouzon et al., 2018).

2. The DEMATEL outperforms ISM as it allows wide variations among relationships between factors (Yang & John, 2003; Zhu et al., 2011; Bai & Sarkis, 2013; Bouzon et al., 2018).

3. Over analytic hierarchy process (AHP), DEMATEL provides multiple directional relationships, while AHP has only a unidirectional relationship and multiple separate matrices requiring integration (Zhu et al., 2011).

4. Compared to the fuzzy set and probability theories, the major benefit of DEMATEL system is its smaller necessity to sample data and flexibility in pattern recognition (Yang & John, 2003).

5. A major advantage of DEMATEL over other systems is its reliance on its ability to produce possible results with minimum data. The employment scope of this system has reached industry, social activities, agriculture, economy, ecology, energy and other areas, and has solved a great number of practical problems in production, life and scientific research successfully (Bouzon et al., 2018).

6. The matrices or digraphs portray a contextual relationship between system elements, where a numeral represents the strength of influence (Bouzon et al., 2018).

Most decision-making methods assume independence between the criteria of a decision and the alternatives of that decision, or simply among the criteria or among the alternatives themselves. However, assuming independence among criteria is too strict to overcome the problem of dependent criteria. Therefore, many papers have discussed ways to overcome this problem. The DEMATEL method is used to detect complex relationships and build the impact-relation map (IRM) of cause and effect relations among criteria and obtain the influence levels of each element over others both directly and indirectly. The methodology can confirm interdependence among criteria and restrict the relations that reflect characteristics within an essential systemic and developmental trend (Yang et al., 2008).

2.6 Success factors' analysis of Lean in Malaysian Automotive

The history of the Malaysian automotive production periods back to the initial 1960s, when the Malaysian administration advanced a strategy to encourage integrated automotive industry to reinforce its manufacturing base and diminish its dependence on the agricultural sector (Sultana & Ibrahim, 2014). In Malaysia, before the presence of the lean concept and practices, the automotive industry has actually practiced the JIT philosophy in 1980s (Mamat et al., 2015). JIT is one of the pillars in the lean concept whereby its main objective is to achieve operational excellence by reducing waste in manufacturing activities (Fullerton & McWatters, 2001). One of the earliest studies on JIT in Malaysia was by Abdul et al. (1998) which discovered that the JIT technique has been practiced and implemented among the Malaysian automotive manufacturers and its suppliers. However, it has been implemented with modification to fit with the existing business environment. In addition to that, there are several factors that have hindered the successful implementation of JIT due to the lack of understanding on the concept, buyer-supplier relationship and employees' attitude. A similar study performed (Simpson et al., 1998) on Malaysian national automobile manufacturers, found that although the JIT philosophy has been implemented, the earlier problems associated with JIT had still remain unsolved (Mamat et al., 2015).

Within the automotive industry in Malaysia, the studies have been done on lean implementation considering 12 success factors (SFs) such as management leadership and commitment, empowerment of employees, employee involvement, training and education, effective communication, organizational culture, feasible lean practices,

human resource management, continual evaluation and measurement, quality management, continuous improvement and external management (Rose et al., 2014); and 12 perceived barriers: unstable customer order, lack of process synchronization, supplier delay on parts delivery, lack of financial supports to invest on necessary equipment for creating cellular production layout, no standardization or balance of workloads among the employees, employees resist to change, inadequate training and lack of knowledge in lean manufacturing, lack of supports from employees in making lean manufacturing efficient and effective, poor quality of supplied parts, poor working culture, poor communication from top management and lack of top management commitment and participation (Roslin et al., 2014). Another study has been done on the basis of a survey for empirical data but excluding some factors such as culture change, project management skill, and employee involvement (Fadly & Mohd, 2013).

2.7 HICOM Automotive of Malaysia

HICOM Automotive Manufacturers (Malaysia) Sdn Bhd is part of the DRB-HICOM Pekan automotive complex, which is among the nation's largest automobile production hubs. It was incorporated in 1983, and is a subsidiary of DRB-HICOM Berhad. The address is DRB-HICOM Pekan Automotive Complex, Peramu Jaya Industrial Area, P.O Box 7, 26607, Pekan, Pahang, Malaysia. The automotive assembly plant has been gazette as a National Automotive Hub in Malaysia (Corporate Info, 2018).

HICOM Automotive Manufacturers (Malaysia) traces its origins to the mid 1970s, once the TATAB Industries Assembly Plant (TIAP) was established under a joint venture between Pahang-based TAB group and Tata of India. In 1983, the Master Carriage group, a partner company of Diversified Resources Berhad (DRB) bought the TIAP facility, and renamed it Automotive Manufacturers (Malaysia) Sdn. Bhd. (AMM). Over the period of the mid 1980s and early 1990s, the AMM plant took on contract assembly for Isuzu, Suzuki and Mitsubishi commercial vehicles, as well as Citroën passenger vehicles. In the mid 1990s, AMM became one of the two plants to participate in the National Commercial Vehicle (NCV) project, when HICOM Commercial Vehicles was established in January 1994 as a joint venture between DRB, HICOM and Isuzu, and in June 1994, Usahasama Proton-DRB (USPD) was established (Automotive industry, 2019).

In July 1995, AMM began operations at a second assembly plant, AMM 2, at the Peramu Jaya industrial estate. By 1995, DRB's relationship with Citroen and Proton had converged into a tripartite joint venture by way of a Proton-badged, Citroen-based, AMM-built model, and by 1996, HICOM Commercial Vehicles had been renamed Malaysian Truck & Bus (MTB), while DRB and HICOM had merged. In 2007, Isuzu acquired a 51% majority stake in MTB, and the company was then renamed Isuzu HICOM Malaysia. AMM had also hosted a second parallel partnership with national car company Proton (Automotive industry, 2019).

By late 2000, Proton had fully acquired USPD, and the company was then renamed Proton Edar. By the mid 2000s, the Pekan automotive complex had taken on assembly of Mercedes-Benz vehicles through a joint venture between DaimlerChrysler Malaysia (DCM) and Malaysian Truck & Bus (MTB). DaimlerChrysler Malaysia was a joint venture between DaimlerChrysler AG which owned Mercedes-Benz, and Cycle & Carriage Bintang (CCB) which is the long-standing Mercedes-Benz franchise holder in Malaysia. In January 2008, DaimlerChrysler Malaysia was renamed Mercedes-Benz Malaysia (MBM), following the Mercedes-Benz and Chrysler demerger. In early 2008, Suzuki Malaysia Automobile became a three-way joint venture between DRB-HICOM, Suzuki and Itochu, when the latter two acquired stakes in the operation. In November 2008, AMM was renamed HICOM Automotive Manufacturers (Malaysia) Sdn. Bhd. (HAMM) (Automotive industry, 2019).

By the dawn of the 2010s, HAMM had started contract assembly of Volkswagen passenger vehicles as part of an agreement with DRB-HICOM and Volkswagen. The Volkswagen Pekan Plant (VPP) was set up within the Pekan complex, and the first VPP-built Volkswagen cars rolled off the assembly line in March 2012. VPP has since produced six different Volkswagen models from the Passat, Polo, Vento, Jetta and Tiguan nameplates. VPP is also one of only two Malaysian plants to have used laser welding in the assembly process. The knock down kits and engines are shipped in from Volkswagen's plants in Germany, Mexico, India and South Africa (Automotive industry, 2019).

In late 2016, HICOM Automotive Manufacturers (Malaysia) changed its abbreviation to HA, from HAMM previously. HA currently operates two main assembly plants in Pekan, which collectively encompass several smaller sub-plants and

facilities. The entire automotive complex is divided by a section of the Federal Route 3 highway, which separates HA Plant 1 to the West, from HA Plant 2 to the East. Plant 1 hosts the Volkswagen Pekan Plant (VPP), which produces Volkswagen passenger vehicles, and the Suzuki Malaysia Automobile plant, which is currently idle. Plant 2 hosts the Mercedes-Benz Malaysia (MBM) plant, which produces Mercedes-Benz passenger and commercial vehicles, in addition to Mitsubishi Fuso commercial vehicles. All three sub-plants assemble vehicles from imported knock down kits (Automotive industry, 2019).

HA specializes in assembly of automotive units for passenger cars and commercial vehicles. Presently HA is assembling passenger cars for Mercedes-Benz and Volkswagen. In the commercial vehicle segment, HA is assembling commercial vehicles for Mercedes-Benz Actros and Mitsubishi Fuso. In term of facilities, HA has a total land area of 143.7 acres, with some operational divisions as HA Plant 1: Paint Shop Operation and Volkswagen Operation, and HA Plant 2: Mercedes-Benz Operation and Commercial Vehicle Operation (Core Business, 2018).

Ismail Pandak**,** Chief Executive Officer (CEO) of HA says in CEO Message, "As one of the key players in passenger cars and commercial vehicle manufacturer and assembly service provider in Malaysia, we are always committed in delivering world class service through exceeding customer requirements, innovating our business processes and enhancing our human and equipment effectiveness." And he added, "Through cultivation of strengths and best practices from DRB-HICOM Group synergy, with foothold in the entire automotive supply chain ecosystem, we make it our priority to continuously improve our process quality, addressing core competencies and maintaining teamwork, integrity and innovativeness" (CEO Message, n.d.).

HA has achieved 'High Productivity Enterprise' award using local workers and the award of 'Industry best practices and quality assurance standards '. In order to achieve global recognition for the services, namely for quality, HA has strived to attain industry best practices and quality assurance standards from benchmark authorities such as TUV Rheinland Group. The pillars of standards and best practices certifications HA achieved include: ISO14001:2004, BS OHSAS 18001:2007, ISO/TS 16949:2009 (Awards, 2018). HA has also got first place of High Performance Company Award &

Special Award for Top Year Outstanding Contribution 2014 organized by Royal Customs and Excise Department (Achievements, 2018).

The Team Speaker Ummu Adilah binti Othman of the team "AMPERE FORCE" of HA has got award and certificate presented by Y.B. Datuk Chua Tee Yong (Deputy Minister of Trade and Industry) in the "Convention on Team Excellence (ICC/QE/Lean/Triz) East Coat Region 2016". Team SWIFT from Suzuki Operation has participated into Team Excellence Convention organized by MPC from 26th ~ 27th August 2015 at Sunway Convention Centre. Total number of teams participated was 130, and rewards were divided into 3 categories which is GOLD, SILVER and BRONZE. The team SWIFT achieved the GOLD (Certificate of Participation, 2018).

2.8 Chapter Summary

Through this literature review, not only the elements of LPs for problem solving are found and constructed but also the composition of the elements are documented in further details. One of the central contributions of the literature review is the list of the success factors of lean implementation which will be used as guidance in the following chapter of methodology. Success factors' analysis of lean in Malaysian automotive and HICOM automotive of Malaysia are also discussed at the end of this chapter.

CHAPTER 3

METHODOLOGY

3.1 Introduction

This chapter describes research characteristics, research design, data collection and analysis method. For the data collection experts' meetings have been planned in details. A crystal clear view on research strategy is provided by discussing Focus Group and DEMATEL for the case study.

3.2 Research Design

The initial step of the study was reviewing literature. The main results of that step included two comprehensive lists of elements of PSPs of lean and potential SFs to implement them. Those results were presented in chapter 2 of this thesis. Those discovered lists allowed us to continue with the next steps of the research methodology presented in the Table 3.1 given below:

Table 3.1 Research Methodology

Research step	**Methods**	**Result**
Data collection from focus group respondents in a case study company, and data analysis	Analyze Focus Group Experts' opinion	SFs for the elements of PSPs.
	DEMATEL	Critical success factors to implement elements of PSPs of lean.

To find SFs for the elements of PSPs of lean, firstly, the three principles of PSPs of 4P model of Toyota was compiled from the literature and divided into distinct

elements. In parallel, the SFs of lean and other relevant managemnt were also consolidated. In the next step, opinion of experts from industry was used to classify highly relevant SFs for each elements of PSPs. Then based on the experts' rating on the pair wise influence among SFs, CSFs for overall and element wise implementation of elements of PSPs of lean were decided using Decision Making Trial and Evaluation Laboratory (DEMATEL). Finally, the results from the study were discussed and concluded with merits. The flow diagram for this research work is given in Figure 3.1.

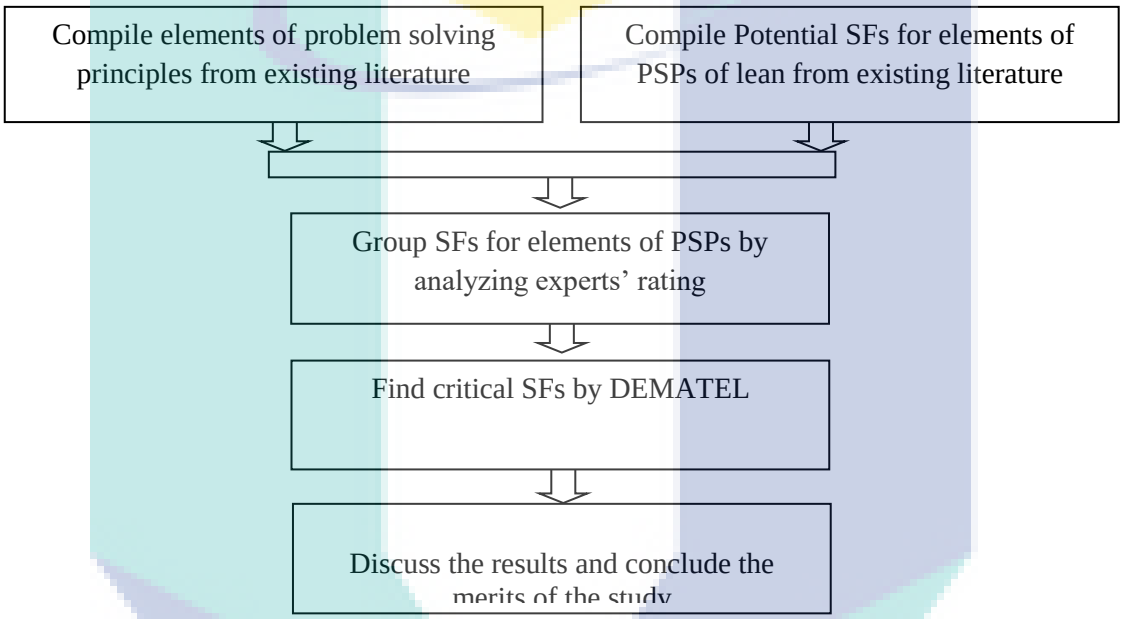

Figure 3.1 Flow Diagram for Research Work

The following ethical guidelines were strongly maintained during the whole period of this research:

1. Research was designed, reviewed and undertaken to ensure integrity and quality.
2. Researcher and respondents of this study were informed fully about the purpose, methods and intended possible uses of the research, what their participation in the research entails and what risks.

3. The confidentiality of information received for research subjects and the anonymity of respondents were strictly maintained.
4. Research participants participated in a voluntary way, free from any coercion. Any harm to research participants was avoided.
5. The independence of research was clear, and there was no conflict of interest.

3.3 Case Study

According to Marshall and Rossman (1999), historically conducting a qualitative inquiry has been "to explore, explain, or describe the phenomenon of interest" (Islam, 2019) and a case study is one of the five qualitative traditions (Creswell et al., 2007, 2015). Additionally, Merriam (1998) claimed that a qualitative case study was an intensive and holistic description, explanation, and analysis of "a bounded system" or phenomenon such as a person, a program, an institution, a process, a social unit, a group and a policy. She additionally claimed that an exploratory case study was fitting when the topic of the research interest had not been studied exhaustively as like as this case of research. Merriam (1998) also suggested that through studying an understudied topic, researchers had opportunities for searching significant factors and to provide a descriptive basis for future studies. Therefore, the case study design is selected as the appropriate research strategy.

According to Yin (2017), the case study has four main components: the study questions, study unit of analysis, the logic linking the data to the proposition, and the criteria for interpreting the findings. Therefore, the main reason for selecting the case study method is that it is the preferred method when attempting to answer "why" and "how" research questions about contemporary events over which the researcher has no control. The companies may fail to implement PSPs of lean successfully if they do not know the CSFs, this relates to the "why" and the cause and effect interrelationships of CSFs aimed to find in this research are about "how". So the case study was appropriate for this research.

The problems of defining what a unit of analysis is and defining what the case is are in confrontation (Yin, 2017). Defining the context of the case requires that the study

questions are defined to ensure that the scope remains in feasible limits, and due to this if the case is defined as a program, implementation process, or organizational change, there will be problems defining the beginning or end points of the case (Yin, 2017). The unit of analysis of this research was a manufacturing company that had implemented lean thinking and a case timeframe started with the formal start of the implementation of lean thinking. The logic linking data to propositions was straightforward that cause and effect relationships among SFs relevant to elements of PSPs of lean and criteria for interpreting the findings was significantly higher impacts of highly relevant SFs of PSPs of lean. Again, due to the reason that this research was not testing the theory rather trying to find CSFs for the implementation of PSPs of lean, the case study method was the most appropriate (Miles et al., 1994).

3.3.1 Selection of the Company

Hicom Automotive (HA) was selected for this study as considered the capability and capacity of operation; manufacturing and management system; diversity of expertise, implementation status of lean, age of the company in operation, the relation with Universiti Malaysia Pahang, Malaysia etc.

The capability and capacity of HA includes Passenger car assembly, SUV & 4WD Vehicles Assembly, Electric & Hybrid car assembly, Testing & Commissioning, World Class Test Track, CMM, Light Duty Truck Assembly, Heavy Duty Truck Assembly, Food Truck, Bus/ Mini Bus Manufacturing, Tractor Assembly/ Manufacturing, Fully Robotic Paint shop, Truck Chassis Extension, Vehicles Modification, any Motor-part manufacturing, Industrial Consultation etc. The company offers a wide range of services with highly flexible development and assembly strategies. It operates using world class manufacturing facilities with efficient management system, and provides complete solutions, from individual systems like modules assembly to complete vehicles manufacturing, and from extra-low volume to high volume production ("Vehicles Assembly & Manufacturing," 2018).

HA had invested new and advance facility in aiming to be the preferred passenger car body painting facility in Malaysia. The technology brought from German are the first Technology in South East Asia, developed according to world famous brands standard, Mercedes Benz and Volkswagen (Introducing, 2018). In July 2017,

HA built this paint shop at the cost of RM230 million expected to be the top national preferred facility for body painting in term of higher process efficiency and optimum operation cost. It is highly automated, and is the nation's first to feature a 360-degree rotating electro-dipping (ED) process (Automotive industry, 2019) adopting ABB IRB5500 Robot and 1000SAD Robobell (Introducing, 2018). Mercedes-Benz Malaysia's models are currently painted at the new paint shop (Automotive industry, 2019). With strong involvement and experiences in vehicles manufacturing, HA was diversify the expertise to form a division to focus on the customize vehicles and special vehicles. HA is one of the certified JPJ (*Jabatan Pengangkutan Jalan*, Road Transport Department) engineering workshops. HA Services are special purpose vehicles; customize vehicles, body building, chassis extension, buses etc. (Special Vehicles, 2018).

On February 28, 2015, a signing ceremony took place at the time of the official opening of the East Coast National Higher Education Carnival at the Chancellery Square in Universiti Malaysia Pahang (UMP), Malaysia. In that signing ceremony UMP has sealed a Memorandum of Understanding (MoU) with HICOM Automotive Manufacturers Sdn Bhd to cooperate on academic, research, human capital development (UMP, n.d.).

3.3.2 Selection of Method of Data Collection

Focus group was chosen as the method of data collection. This method is regularly used across a wide variety of research disciplines, including health sciences, marketing, communications, and nearly all fields of behavioral and social sciences (Guest et al., 2017). A group discussion was planned which was 'centered on the research topic, and facilitated and coordinated by a moderator or facilitator to generate qualitative data, by capitalizing on the interaction within the group setting (Sim & Snell, 1996). The idea behind the focus group technique was that it "can help people to explore and clarify their views in ways that would be less easily accessible in a one to one interview... When group dynamics work well the participants work alongside the researcher, taking the research in new and often unexpected directions" (Kitzinger, 1995).

The aim was to get not only information about a range of ideas and feelings that individuals had about certain issues, but also to illuminate the differences in perspective between groups of individuals. To generate large amounts of data in a relatively short time span, and to use the findings to precede quantitative procedures; focus group method was preferred. Again, like one-to-one interviews, the results of focus-group discussions can be presented in uncomplicated ways using lay terminology supported by quotations from the participants (Rabiee, 2004). The uniqueness of a focus group was its ability to generate data based on the synergy of the group interaction (Green et al. 2003). There were a number of broad advantages to the use of focus group as summarized below:

1. An economical way of getting the views of a number of people, simply because respondents are discussed in groups rather than one by one (Krueger, 1994).
2. Provide information on the 'dynamics' of attitudes and views in the context of the interaction in a group, rather than static way in which these phenomenon were portrayed in questionnaire studies (Morgan, 1988)
3. Support greater degree of spontaneity in the expression of opinions than other methods of data collection (Butler, 1996).
4. Provide a 'safe' forum for the expression of views, e.g. participants did not feel obliged to respond to every question (Vaughn et al., 1996)
5. Respondents felt encouraged and empowered by a sense of group membership and cohesiveness (Goldman, 1962; Peters, 1993).

3.3.3 Selection of Experts

According to Lederman, a focus group is, 'a technique involving the use of in-depth group discussions in which participants are selected because they are a purposive, although not necessarily representative, sampling of a specific population, this group being 'focused' on a given topic'. Therefore, participants were selected on the criteria that they would have something to say on the topic, were within the age-range, had similar socio-characteristics and would be comfortable talking to the moderator and

each other (Richardson & Rabiee, 2001). Participants who were accessible, willing to provide information, and distinctive for their accomplishments and ordinariness, or who were able explaining PSPs of lean were chosen. Also, the individuals who could deliver first hand information about SFs for implementing PSPs of lean and at the same time indicate the relationship among these SFs within the Malaysian automotive context were selected carefully.

This study took the education and experience level of respondent into consideration as respondents who have education higher than bachelor degree and more than five years of working experiences have better understanding of the lean concepts (Banhan Lila, 2012). Within this study, the highest number of participants was targeted within the middle management in the role of production/operations/process engineer whose work was directly linked to the lean implementation process. This had the advantage that most of these employees had hands-on experience when working within lean, and at the same time had a grounded knowledge about LPs. The participants are lean six sigma black belts and have work experience with lean.

Omitting operators could restrict in obtaining an inside view on the SFs within the shop floor (Bollbach, 2012). So the plan was to discuss with participants who work closely together with operators, so that insiders' views of the SFs within the shop floor were captured. Most operators might not have detailed knowledge of the functions of the Lean (Bollbach, 2012). Participants were mostly department managers. Because they acted as gate keepers and initiate further access to potential participants by recommending their subordinates. Specially, other participants were more willing to participate in this research as the research was supported by the top management.

3.3.4 Sample Size

While there were no hard and fast rules; as the group was homogeneous, a smaller sample of between ten to fifteen people might yield sufficient results. There was a reduction in group error or an increase in decision quality as sample size increased (Skulmoski et al., 2007). During setting up a focus group, it was generally felt that eight to twelve was a fitting number of participants (Stewart & Shamdasani, 2014). Smaller groups of four to six to participants could have been used (Strong et al., 1994).

One common guideline was that focus group research required at least two groups for each defining demographic characteristic (Krueger & Casey, 2015). Kirchberger et al. (2009) found eight focus groups and Coenen et al. (2012) found five focus groups to reach saturation for deductive approach. Both of them defined saturation as the point at which the connecting concepts from two consecutive focus groups revealed no extra second-level categories. Romney et al. (1986) calculated that as few as four individuals can provide accurate information with a confidence level of 0.999 if they possess a high degree of knowledge on the domain of inquiry. Morgan et al. (2002) found that the first 5-6 participants produced the majority of new data, and little new information was gained as the sample size approached twenty participants, and across their four data sets, approximately 80–92% of concepts were known within the first ten responses (Guest et al., 2017).

In this study, for reasons of control and consistency, there was an attempt to limit the size of the focus groups to four groups with four members in each group i.e. total sixteen participants. This size of participants favored to get the right amount and quality of data.

3.3.5 Moderation

For this study, the Capability Development Program Manager of HICOM automotive was selected as the moderator. He was leading the process improvement teams for 11 years in HA with his total 18 years' experience on operation excellence. He is a certified Six Sigma Black Belt (SSBB) as well. The role of the focus group moderator was crucial to the nature and quality of the data collected. The personality and interpersonal skills of the moderator influenced powerfully the process of interaction that occurred. The way in which the moderator behaved, and the verbal and non-verbal cues that he gave to the group, were pivotal in this respect (Vaughn et al., 1996).

A particular difficulty was in striking the right balance between an active and a passive role of the moderator. He had to generate interest in discussion about a meticulous topic, which was close to his or her professional or academic interest. Conveying an impression of 'expertise' was likely to be unfavorable to disclosure from participants: the moderator indicated that he was there to learn from the respondents,

rather than the reverse (Millward, 1995). As far as possible, the moderator ensured that dialogue occurred among the group members, rather than between them and the moderator (Carey & Smith, 1994).

The moderator was sufficiently involved in the group to fulfill the role of facilitator, but not so dominant as to bias or inhibit discussion (Goldman, 1962). Nyamathi & Shuler (1990) described the moderators in their study as providing 'mild, unobtrusive control' over the group. Butler (1996) found that by taking up a relatively passive role and allowing discussion to be led primarily be the group respondents, the moderator facilitated the expression of potentially sensitive or emotive issues. The need for some degree of active facilitation was highlighted (Halloran & Grimes, 1995) and the overall input from the moderator constitute between 5% and 10% of the resulting transcript (Hague et al., 2004).

3.3.6 Consensus and Dissent

The group dynamics which took place in the focus group were vital to its success. However, these interpersonal processes might cause problems in the interpretation of focus group data. The `censoring' of dissenting views held by less confident participants within the group could be a problem. The emergence of inharmonious views and perspectives what Kitzinger (1994) called `argumentative inter-actions' often contributed importantly to the richness of focus group data, but might be artificially suppressed. Certain members of the group might be more confident or eloquent than others, and their views might come to dominate the proceedings; such individuals had been described as `thought leaders' (Henderson, 1995).

In the process, members of the group who were less self-confident or less eloquent might be introverted from expressing alternative viewpoints. That reflected the tendency of those who found themselves in a minority to consent to the majority view (Carey & Smith 1994). The effect of that might be that those alternative views were simply not voiced, and those who remained relatively silent were falsely assumed to agree. Hence, whilst silence might at times indicate agreement, it might also represent an unwillingness to dissent. Skilful questioning by the moderator assisted in distinguishing those two possibilities (Asbury, 1995), and asking participants to write

their views down in advance helped disclosure from less confident members (Sim, 1998).

Generally speaking, the more homogeneous the membership of the group, in terms of social background, level of education, knowledge, and experience; the more confident individual group members are likely to be in voicing their views. Thus, heterogeneous groups were undesired (Stewart & Shamdasani, 2014) and the rule for selecting focus group participants was 'commonality, not diversity' (McElroy et al., 1995).

The viewpoint which was shared by the groups was in one direction or other on the attitude continuum it might be overstated through a group polarization effect (Turner, 1991). The prevalent group viewpoint would tend to meet on the end of the continuum in question, but would also tend to be amplified in the process. The more homogeneous the participants were, the greater was the likelihood of polarization. The moderator was cautious of using issues emerging from one group as triggers for discussion in sub-sequent groups. The moderator thereby created, rather than discovered, a commonality of issues across groups (Sim, 1998).

3.3.7 Strength of Opinion

Contrary to a traditional survey research demonstrated by the use of questionnaire, the number of participants expressing a certain view and the rating that they may give it on an attitude scale are normally taken as an index of the commonness or strength of that view (Vaus, 2013), in focus groups a number of potential indices of the strength of a particular view-point were considered e.g. the number of respondents who express it, the intensity or emphasis (both verbal and nonverbal) with which it is expressed, and the number of dissenters.

It was argued that the counting of data has a place in qualitative research (Silverman, 1985). However, some members of the group did not express a viewpoint on some factors which indicated a specific pattern of interaction. Similarly, the strength with which views were expressed was a reflection of the interaction, rather than a direct expression of underlying attitudes. Initially, it was in doubt whether separate focus groups could be compared in terms of the relative strength of opinion. Indeed seeking

to quantify the expression of views within qualitative research faced difficulties; hence the researcher introduced this approach with caution (Sim, 1998).

3.3.8 Focus Group Protocol

Three phases had been planned for the focus group which was planning before the focus group; conducting the focus group, and interpreting and reporting the results. As a guideline for the focus group, the steps involved in each phase are given below:

First phase:

1. Contacted with human resource manager and discussed about the research to get approval
2. Got moderator selected by Human Resource Manager and contacted with moderator
3. Discussed with moderator about the research (objectives, significance, ethics etc.) and got the participants identified by moderator
4. Determined how many focus groups and how many participants in each group were required
5. Prepared templates to fill with data
6. Scheduled meetings' date, time and venue
7. Shared documents and literatures relating to the study with moderator to distribute to all participants before meeting so that everyone had focus on the data required.

Second Phase:

1. Brought materials such as notebook/computer, focus group list of participants, data collection templates etc.
2. Arrived on time

3. Got participants introduced, shared the importance of the input of participants, purpose of the assessment etc., and got the focus group carried on by the moderator according to the plan
4. Got the session conducted by the moderator mindful to set a positive tone, to make sure everyone was heard, to draw out quieter group members, to avoid argument on a point with any participant and to thank participants

Third phase:

1. Got a quick summary of the impressions of the moderator immediately after the meeting
2. Analyzed the summaries and data, and interpreted the results such as major findings, any recommendations etc.

3.4 Data Collection

A recommendation (or application) letter from the Faculty of Industrial Management, University Malaysia Pahang was issued to seek approval from the selected industry HICOM Automotive. The researcher met with the Human Resource responsible and got approval upon discussion. The approval letter is presented in Figure D1 in Appendix D. The Human Resource personnel had selected the Capability Development Program Manager as Moderator for the Focus Group data collection.

The process of data collecting in a focus group was a delicate and complex one. Data was planned to collect not only on what respondents say, but also on how they interacted with one another, and quotations were planned to attribute accurately to individual members. The process did not interfere with or detract from the coordination of the group, and the method of recording data was not itself had reactive effects upon the group respondents (Sim, 1998).

Most of the employees were found very busy at any working hour in the organization (Bollbach, 2012). So schedules of meetings were settled in well advance

with the human resource manager of the company. Another important consideration in this data-collection process was the precise means by which data were recorded. In order to allow verbatim analysis, tape-recording was generally recommended. But later on, it would be difficult to understand who had said what in tape-recording. Video-recording also might have adverse reaction (Sim, 1998). As a solution, in this research, written notes were taken for who said what at points in the meetings where this was important for purposes of subsequent analysis.

Table 3.2 was used (Islam et al., 2018a) to get idea on lean status of the target participants. The questions were significant for enabling the retrieval of the relevant and accurate information on lean manufacturing utilization within the company. From the answers to these questions, it was verified instantly as whether such a company understood and was actually practicing lean or not. This was significant for the retrieval of information on the factors that are critical to lean implementation.

Data was collected in the company during the period from January 2019 to February 2019. The Focus Group meetings were structured to last for 90 minutes. The intention was to gather as much information as possible in a limited time without demoralizing the participants. It was believed that in this way, answers to relevant questions could be provided decisively.

Table 3.2 General Questions For Industry Experts

Question	Options	Answer
Please mention your department/section?	Production / Quality / Operations / Technical / Maintenance / Administration / Human Resources / Training / Marketing and Sales / Health, Safety & Environment (HSE) / Accounts and Finance / Logistics and Procurement / Consultant / CEO / General Manager / IT / Industrial Engineering (IE) / Process Engineering / Other:	
Please indicate no. of years of practical experience/involvement you've with lean	<2 years or 2 – 5 years or >5 years	

Table 3.2 Continued

Question	Options	Answer
Please indicate no. of years of practical experience/involvement you've with lean	<2 years or 2 – 5 years or >5 years	
Which of the below best describe your experience with lean?	External consultant/Internal facilitator/Manager/Non-management employee	
Which of the following describe your organization's success with lean?	Best in class (lean has become the integral part of company culture) / Industry average (lean is partially implemented) / Laggard (in the learning stage only) / Failed (tried and stopped)	

The subsequent step of data collection was data analyses and the assessment of the studied company. The assessment focused on two main areas: the status of lean implementation and the factors' level of influence for successful implementation of PSPs of lean.

3.5 Data Analysis

3.6.1 Validity and Reliability

Validity explains how well the collected data is conversed the actual area of investigation (Ghauri & Gronhaug, 2005). Face validity was the extent that measurement instrument items linguistically and analytically looked like what was supposed to be measured, and the recommended techniques were post hoc theory, expert assessment of items, Cohen's Kappa Index (CKI) etc. The content validity was the extent that measurement instrument items were relevant and representative of the target construct, and the recommended techniques were literature review; expert panels or judges; content validity ratios (CVRs) etc. The judgmental approach to establish content validity involved literature reviews and then follow-ups with the evaluation by expert judges or panels. The procedure of judgmental approach of content validity

required researcher to be present with experts in order to facilitate validation (Taherdoost, 2016).

In this study, elements of PSPs of lean and SFs to implement them were compiled by literature review, and assessed by the industry experts' scoring based on '0' for 'no relevance', '1' for 'low relevance', '2' for 'medium relevance', '3' for 'high relevance' and '4' for 'very high relevance'. Firstly, the average of all sixteen participants' score will be calculated for each factor separately for each element and then the average for all elements. If the average score of a factor for all elements is below '2' (relevant) and no scores for any element is close to '4' (extremely relevant); the factor will be considered not highly relevant and will keep outside of the study.

The followed method was more robust; because in traditional CVR method, items are assessed using three point scale (not necessary, useful but not essential and essential) only and a linear transformation of a proportional level of agreement on how many "experts" within a panel rate an item "essential" is considered (Lawshe, 1975).

Reliability was considered as a concern that the extent to which the measurement of the phenomenon provided stable and consistent result (Carmines & Zeller, 1979). It was also concerned with repeatability. For example, a scale or test was said to be reliable as repeat measurement made by it under constant conditions gave the same result (Moser & Kalton, 2017). Testing for reliability was considered important as it was referred to the consistency across the parts of the measuring instrument (Huck, 2007). A scale was said to have high internal consistency reliability as the items of the scale was like "hang together" and measured the same construct (Huck, 2007; Robinson, 2010; Taherdoost, 2016).

In this study, the most commonly used internal consistency measure of the Cronbach Alpha Coefficient (Cronbach, 1951; Taherdoost, 2016) was used with Likert scales. Because Cronbach Alpha coefficient is viewed as the most appropriate measure of reliability when Likert scales are used (Robinson, 2010). Minimum internal consistency coefficient was considered as 0.70, because there is no absolute rule for internal consistencies, but most agree on 0.70 as minimum (Robinson, 2010; Taherdoost, 2016). All the calculations were carried out in Microsoft Excel in stead of any costly statistics software package. The formula used as given below:

Cronbach Alpha Coefficient = K/(K-1)*(1-(A/B))

Here, K = Number of data,

A = Sum of Square of standard deviations and

B = Square of sum of standard deviations (Mondal & Mondal, 2017).

3.6.2 DEMATEL Method

DEMATEL method was originally developed between 1972 and 1979 in the Science and Human Affairs Program of the Battelle Memorial Institute of Geneva, with the purpose of studying the complex and intertwined problematic group. It has been widely accepted as one of the best tools to solve the cause and effect relationship among the evaluation criteria (Wu & Lee, 2007; Lin & Tzeng, 2009). This method is applied to analyze and form the relationship of cause and effect among evaluation criteria (Yang et al., 2008) or to derive interrelationship among factors (Lin & Tzeng, 2009). According to Wu & Lee (2007), Yang, et al. (2008) and Shieh et al. (2010), the procedure of DEMATEL method is presented in Figure 3.2.

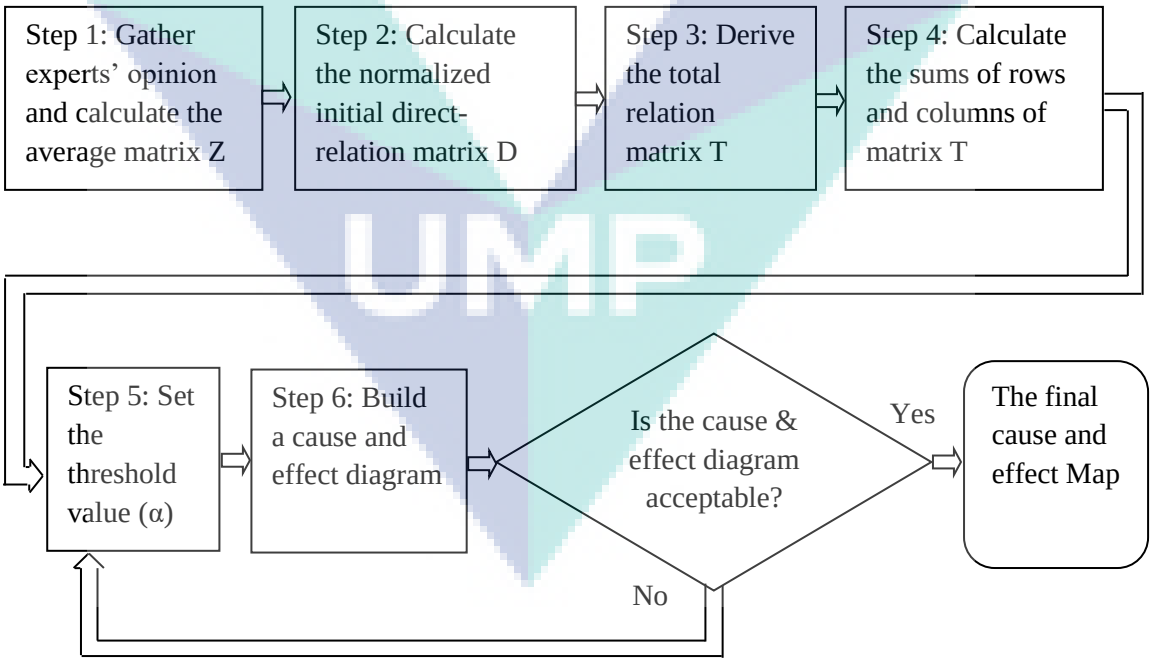

Figure 3.2 DEMATEL Analysis Flow Diagram

Source: Sumrit & Anuntavoranich (2013), Kumar & Mathiyazhagan (2020)

The steps of DEMATEL are described below:

Step 1: Gather experts' opinion and calculate the average matrix Z

A group of m experts and n factors are used in this step. Each expert is asked to view the degree of direct influence between two factors based on pair-wise comparison. The degree to which the expert perceived factor i affects on factor j is denoted as X_{ij}. The integer score is ranged from '0' (no influence), '1' (low influence), '2' (medium influence), '3' (high influence), and '4' (very high influence), respectively.

For each expert, an n x n non-negative matrix is constructed as $X^k = X_{ij}^k$, where k is the expert number of participating in evaluation process with $1 \leq k \leq m$. Thus, X^1, X^2, X, ..., X^m are the matrices from m experts (Liu et al., 2011; Sumrit & Anuntavoranich, 2013).

To aggregate all judgments from m experts, the average matrix $Z = [z_{ij}]$ is shown below (Sumrit & Anuntavoranich, 2013):

$$z_{ij} = \frac{1}{m}\sum_{i=1}^{m} x_{ij}^k \qquad 3.1$$

Step 2: Calculate the normalized initial direct-relation matrix D

The normalized initial direct-relation matrix $D = [d_{ij}]$, where value of each element in matrix D is ranged between [0, 1]. The calculation is shown below (Yang et al., 2008; Sumrit & Anuntavoranich, 2013):

$$D = \lambda * Z. \qquad 3.2$$

or

$$[d_{ij}]_{nxn} = \lambda\,[z_{ij}]_{nxn} \qquad 3.3$$

Here,

$$\lambda = Min\left[\frac{1}{max\ 1\le i\le n \sum_{j=1}^{n}|z_{ij}|}, \frac{1}{max\ 1\le i\le n \sum_{j=1}^{n}|z_{ij}|}\right] \quad 3.4$$

Based on Markov chain theory, D^m is the powers of matrix D, e.g. D^1, D^2, D^3,…, D^∞ guarantees the convergent solutions to the matrix inversion as shown below (Yang et al., 2008; Sumrit & Anuntavoranich, 2013):

$$\lim_{m\to\infty} D^m = [0]_{n\times n} \quad 3.5$$

Step 3: Derive the total relation matrix T

The total-influence matrix T is obtained by utilizing Eq. (3.7), in which, I is an n×n identity matrix. The element of t_{ij} represents the indirect effects that factor i had on factor j, then the matrix T reflects the total relationship between each pair of system factors (Liu et al., 2011; Sumrit & Anuntavoranich, 2013).

$$T = \lim_{m\to\infty}(D + D^2 + \ldots + D^m) = \sum_{m=1}^{\infty} D^i \quad 3.6$$

where

$$\sum_{m=1}^{\infty} D^i = D^1 + D^2 + \ldots + D^m$$
$$= D\,(I + D^1 + D^2 + \ldots + D^{m-1})$$
$$= D\,(I - D)^{-1}(I - D)(I + D^1 + D^2 + \ldots + D^{m-1})$$
$$= D\,(I - D)^{-1}(I - D^m)$$

$$T = D\,(I - D)^{-1} \quad 3.7$$

Step 4: Calculate the sums of rows and columns of matrix T

In the total-influence matrix T, the sum of rows and the sum of columns are represented by vectors r and c, respectively:

$$r = [r_i]_{nx1} = \left(\sum_{j=1}^{n} t_{ij}\right)_{nx1}, \quad 3.8$$

$$c = [c_j]'_{1xn} = \left[\sum_{j=1}^{n} t_{ij}\right]'_{1xn}, \quad 3.9$$

Here $[c_j]'$ is denoted as transposition matrix (Liu et al., 2011; Sumrit & Anuntavoranich, 2013). Let r_i be the sum of ith row in matrix T. The value of r_i indicates the total given both directly and indirectly effects, that factor i has on the other factors. Let c_j be the sum of the j^{th} column in matrix T. The value of c_j shows the total received both directly and indirectly effects, that all other factors have on factor j. If j = i, the value of $(r_i + c_i)$ represents the total effects both given and received by factor i. In contrast, the value of $(r_i - c_i)$ shows the net contribution by factor i on the system. Moreover, when $(r_i - c_i)$ was positive, factor i was a net cause. When $(r_i - c_i)$ was negative, factor i was a net receiver (Yang et al., 2008; Lee et al., 2009; Sumrit & Anuntavoranich, 2013).

Step 5: Set a threshold value (α)

The threshold value (α) was computed by the average of the elements in matrix T, as computed by Equation 3.10. This calculation aimed to eliminate some minor effects elements in matrix T (Yang et al., 2008).

$$\alpha = \frac{\sum_{i=1}^{n}\sum_{j=1}^{n}[tij]}{N} \quad 3.10$$

Here, N is the total number of elements in the matrix T.

In order to explain the structural relationship among the criteria while keeping the complexity of the system to a manageable level, it is necessary to set a threshold value to filter out negligible relationships in matrix T. If the value is too low, the cause and effect diagram will be too complex to show the necessary information for decision-making. On the other hand, some important factors may be excluded if the threshold value is too high. The threshold value can be chosen by the decision maker or through discussions with experts (Lin & Tzeng, 2009).

The brainstorming technique (Azadeh et al., 2015), the maximum mean de-entropy (Lee & Lin, 2013), the average of all elements in the matrix (Sara et al., 2015), or the maximum value of the diagonal elements of the matrix (Tan, & Kuo, 2014) etc. are used to set the value of α. Therefore, each researcher will obtain different threshold values in different ways (Costa et al., 2015). To show how influence affects (Shieh et al., 2010; Liu et al., 2011), the factors that t_{ij} is greater than α, are selected to draw the cause and effect diagram (Yang et al., 2008).

In the impact relations diagram, the lines with arrows indicate the direction of the relationship between SFs that have a matrix value higher than the threshold value. For example, factor F1 has matrix value 1.00, 2.00, 3.00 for F1, F2 and F3 respectively; F2 has matrix value 2.00, 6.00, 7.0 for F1, F2 and F3 respectively; and F3 has matrix value 2.00, 3.00, 1.00 for F1, F2 and F3 respectively; the calculated threshold value α is 3.00. For this example, the cause and effect diagram is as shown in Figure 3.3.

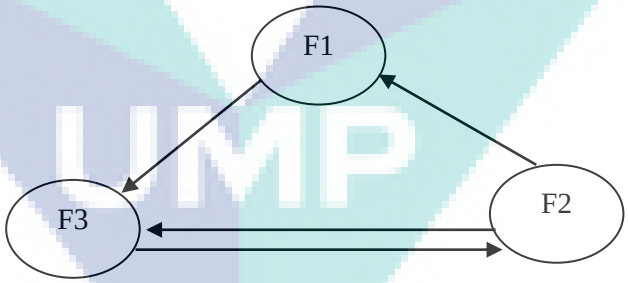

Figure 3.3 Example of Cause and Effect Diagram

Step 6: Build an impact relation map

The impact relation map (IRM) is constructed by mapping all coordinate sets of $r_{i+}c_i$, r_i-c_i in scatter plot to visualize the complex interrelationship and provide information to judge which are the most important factors (Yang et al., 2008). The x-axis represents the importance of factors increasing from left to right while the y-axis displays the most influencing factors on top of the map, while at the bottom it is possible to identify those factors that are more likely to be influenced in the model.

In classical DEMATEL studies, the factors are classified in a complicated system into four quadrants according to their locations in the diagram. Chuang et al. (2013), Chien et al. (2014) and Hwang et al. (2016) have divided the IRM into four quadrants from 1 to 4, as displayed in Figure 3.4, by calculating the mean of r+c.

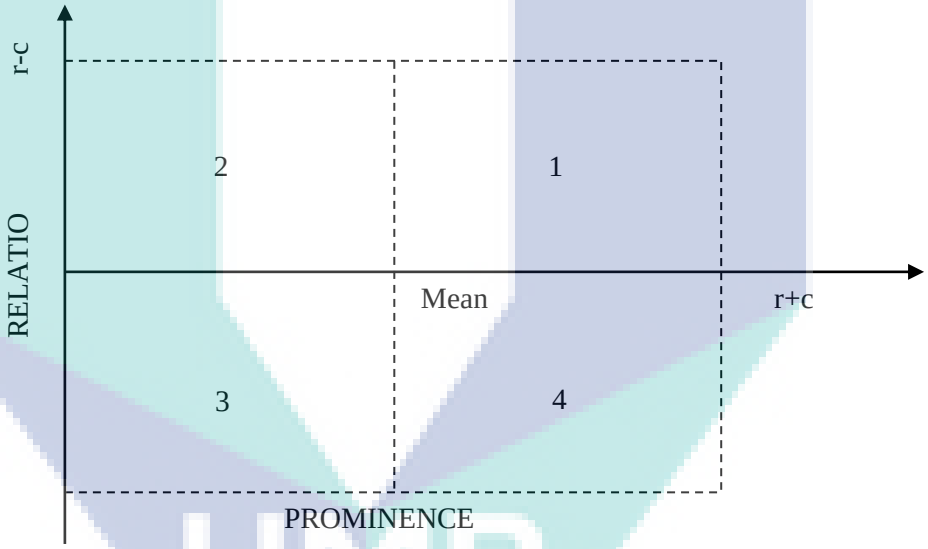

Figure 3.4 Four Quadrants IRM Structure
Source: Si et al. (2018)

As r+c represents prominence and r-c represents relation, the factors in Quadrant 1 are identified as core factors or intertwined givers since they have high prominence and relation; the factors in Quadrant 2 are identified as driving factors or autonomous givers because they have low prominence but high relation. The factors in Quadrant 3 have low prominence and relation and are relatively disconnected from the system; they are called independent factors or autonomous receivers. The factors in Quadrant 4 have high prominence but low relation, so they are impact factors or intertwined receivers, as impacted by other factors and cannot be directly improved.

Thus decision makers can visually detect the complex causal relationships among factors and further spotlight valuable insights for decision making (Si et al., 2018).

3.6 Generalizability of the Findings

Case studies are often criticized on the grounds that their findings are not generalizable to other settings because of the small-N problem (Steinmetz, 2004; Gerring, 2007). But it is not simply a function of the number of units one has observed. More important the kind of unit observed, that is, the range of characteristics of the unit investigated and the range of conditions under which observation occurred. The range of characteristics included in a sample increases the range of population characteristics to which generalization is possible (Kennedy, 1979). Gibbert et al. (2008) reviewed all case studies published from 1995 to 2000 in ten leading management journals, and investigated how case study researchers discussed the procedures associated with generalizability and found that case studies were more likely to provide reports on generalizability. The main cause of the debates about the generalizability of case study results is that the concept of generalization itself is often misconceived (Tsang, 2014).

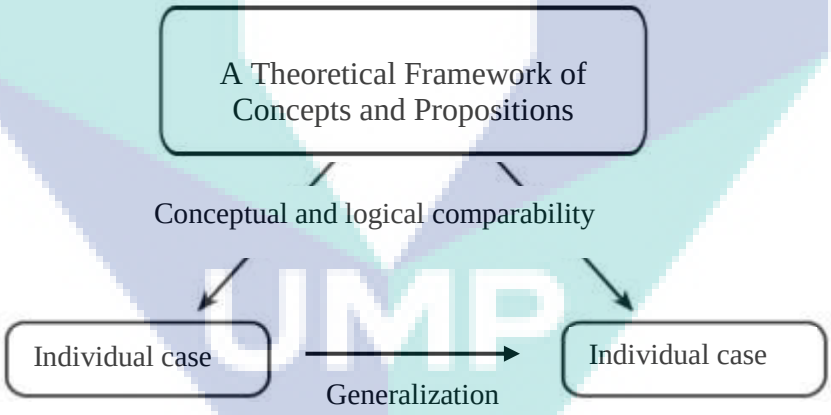

Figure 3.5 The Process of Theoretical Generalization.

Source: Sim (1998)

Schwandt (1997) defined generalization as a "general statement or proposition made by drawing an inference from observation of the particular". There are at least two different types of generalization. One is what might be termed as empirical generalization, characteristic of positivistic and post-positivistic approaches to research, where data are assumed to represent a wider population of people, events or situations

in a strict probabilistic sense (Guba & Lincoln 1994). Alternatively, there is theoretical generalization; the process is shown in Fig 3.5.

Theoretical generalization from case studies is “an increasingly popular and relevant research strategy that forms the basis of a disproportionately large number of influential studies” (Eisenhardt & Graebner, 2007). Tsang (2014) systematically reviewed case studies published in Academy of Management Journal, where a significant contribution to theory is a prerequisite for acceptance, during 2008–2012 and argued that case studies have merits over quantitative methods in terms of theoretical generalization, identifying disconfirming cases and providing useful information for assessing the empirical generalizability of results. Walton (1992) went further to argue that “case studies are likely to produce the best theory”. Again, Tsang (2014) argued that although it is not likely that a new theory can be developed from a single study, whether qualitative or quantitative, theoretical frameworks or implications can still be generated or existing theories are refined.

In theoretical generalization, the data gained from a particular study provide theoretical insights which possess a sufficient degree of generality or universality to allow their projection to other contexts or situations which are comparable to that of the original study. This depends upon their certain embodying concepts within a particular theoretical framework, largely irrespective of any similarities or differences in the pattern of attributes or variables exhibited. The theoretical generalization may be feasible within focus groups studies, even if the first is not. Moreover, it is more likely to be the sort of generalization sought, in terms of the underlying research question (Sim, 1998).

Some general factors that affect the rate at which saturation is approached in order to get the generalizability of the findings are sample homogeneity; degree of instrument structure; complexity of the study topic; and analyst categorization style (Guest, 2015). This study utilized one highly experienced moderator and most participants were lean six sigma black belts; they have similarities with respect to background of society, education, employment, industry etc. A well structured instrument with fixed queries with fixed range of answers was used to ask verbatim of all groups and in the same order. This study was classified between simple and moderately complex, and the participants were asked about their opinions of and

experience within the research topic. Also, the range of SFs was large, and the subject matter was management with a simple topic in that participants were relaying their personal experiences and discussing common factors (Guest et al., 2017). Hence the results from this study were highly expected to generalizable in context of Malaysia.

3.7 Chapter Summary

After selecting the case company and focus group participants, applying the reliable method of DEMATEL to analyse diverse experts' opinion was the stronger choice to maintain quality of the research. Enough data and information were expected from HA as well. Finally, merging the CSFs for the implementation of all elements of PSPs provided a complete list of CSFs for the successful implementation of problem solving in context of Malaysian automotive. Data validation and reliability test methods are also described in this chapter.

CHAPTER 4

RESULTS AND DISCUSSION

4.1 Introduction

In this chapter, analysis of data collected from focus group (FG) is presented based on two approaches: overall implementation and element wise implementation. The outcomes from the application of DEMATEL have been discussed as well.

4.2 Focus Group

General questions to participants provided the information as in Table 4.1 where laggard (slowcoach), average (medium paced) and failed are the perceived status of lean in the eye of participants.

Table 4.1 General Information of Participants

FG No.	Occupation category	Experience with Lean with lean	Experienced lean as	Perceived lean success
1	Production/Operations	2 – 5 years	Manager	Laggard
	Production/Operations	2 – 5 years	Non-management	Laggard
	Quality	> 5 years	Manager	Average
	Quality	2 – 5 years	Non-management	Laggard
2	Process Engineering	< 2 years	Manager	Laggard
	Process Engineering	2 – 5 years	Manager	Laggard
	Marketing/sales	2 – 5 years	Manager	Average
	Marketing/sales	> 5 years	Manager	Failed

Table 4.1 Continued

FG No.	Occupation category	Experience with Lean with lean	Experienced lean as	Perceived lean success
3	Engineering/Technical/	> 5 years	Non-	Average
	Engineering/Technical/	2 – 5 years	Non-	Laggard
	Human Resources/Training	2 – 5 years	Manager	Average
	HSE	2 – 5 years	Manager	Average
4	IE	< 2 years	Non-	Failed
	Finance/Administration	2 – 5 years	Non-	Failed
	Logistics/Distribution/	2 – 5 years	Non-	Failed
	IT	< 2 years	Manager	Laggard

In focus group discussions, participants were found highly interested to go for in depth analysis. To identify which SFs are relevant separately for the 10 elements of PSPs of lean, they suggested that instead of just putting 'X' mark if relevant; scoring based on '0' for 'no relevance', '1' for 'low relevance', '2' for 'medium relevance', '3' for 'high relevance' and '4' for 'very high relevance' would bring better results. The scoring from '0' to '4' was followed. Referred to sub-section 3.6.1, the data were valid and also reliable as Cronbach Alpha coefficient was found as 0.99926 as per Table E1 in Appendix E.

The Table E2 in Appendix E shows the average scores of SFs for elements of PSPs of lean based on scores given by 16 experts. F7, F13, F17, F18, F20, F24, F30 and F36 have average score less than 2 (relevant); but F7, F13, F20 ad F24 have high individual scores close to 4 for some elements; these factors are considered as important. Hence only F17, F18, F30 and F36 will be omitted for DEMATEL (the first research objective). The list of factors in Table E3 in Appendix E is showing scores greater than or equals to 3 as bold.

4.3 Analyse of All Factors Together Using DEMATEL

All the 32 SFs selected for further analysis have been compared in pairs by the same focus group experts who scored as 0 for 'No influence', 1 for 'Low influence', 2 for 'Medium influence', 3 for 'High influence' and 4 for "Very high

influence'. Referred to sub-section 3.6.1, the data were valid and also reliable as Cronbach Alpha Coefficient has been found as 0.99991 as per Table F1 in Appendix F.

Then, the steps of DEMATEL analysis have been followed. Average matrix is calculated with the arithmetic average of respondents' opinions using expression 3.1, the average matrix Z has been found as in Table G1 in Appendix G. On the basis of the average matrix Z, the normalized direct-relation matrix D is obtained through expressions 3.2 or 3.3 and 3.5. The D matrix is shown in Table G2 in Appendix G; and the total relation matrix T is determined by expression 3.6, as presented in Table G3 in Appendix G. Finally, to calculate r+c; the r value and c value are calculated using equations 3.8 and 3.9; and r+c and r-c values are also shown in Table G3 in Appendix G. The larger is the value of r+c, the greater importance of the corresponding SF in terms of overall relationships with other SFs. Therefore, this measure allows identifying the ranking of relative importance of the 32 SFs. Again, if the value of r-c is positive, the factor is a net cause; and if negative, it is a net effect. Table 4.2 shows the ranks, net causes and net effects for selected factors (the second research objective):

Table 4.2 Ranking, and Net Causes and Net Effects Identification

Sl.	Success factors	r+c	Rank	r-c	Comments
F9	Total commitment to theories & tools	10.11	1	-0.44	Net effect
F33	Apply the full set of lean principles and tools	9.99	2	0.07	Net cause
F29	Motivation	9.63	3	-0.18	Net effect
F34	Quality awareness and management	9.60	4	0.19	Net cause
F27	Extend beyond production & to suppliers	9.56	5	0.56	Net cause
F22	Teamwork	9.52	6	0.32	Net cause
F6	Leadership from top management	9.40	7	-0.48	Net effect
F14	Engagement of Process Owners	9.37	8	-0.08	Net effect
F8	Organizational culture	9.32	9	0.15	Net cause
F25	Metrics and accountability	9.26	10	1.03	Net cause
F28	Manage reactions	9.08	11	-1.10	Net effect
F13	Project management	9.08	12	-1.41	Net effect
F35	Inventory control	9.06	13	-0.37	Net effect
F21	Effective communication	8.99	14	0.28	Net cause
F31	Business strategy	8.89	15	0.29	Net cause
F32	Detailed Implementation plan	8.72	16	0.80	Net cause
F23	Right kind of training	8.67	17	1.00	Net cause
F10	Resistance to change	8.44	18	-0.90	Net effect

Table 4.2 Continued

Sl.	Success factors	r+c	Rank	r-c	Comments
F24	Downtime management	8.39	19	-0.90	Net effect
F2	Manageable goals	8.34	20	-1.79	Net effect
F1	Vision and business plan	8.22	22	-0.24	Net effect
F5	Compelling need to change	8.16	23	0.98	Net cause
F26	Keep track of progress	8.08	24	1.92	Net cause
F19	Understand the process	8.05	25	1.44	Net cause
F4	Human resource empowerment	8.03	26	0.77	Net cause
F12	Timing for change	7.89	27	-1.56	Net effect
F16	Skills and expertise	7.29	28	1.29	Net cause
F11	Resources allocation	7.17	29	-0.39	Net effect
F3	Organizational structure	6.96	30	-0.98	Net effect
F20	Create internal consultant	6.81	31	-0.73	Net effect
F7	Financial capabilities	5.95	32	0.10	Net cause

The calculated threshold value α was 0.13 and the author decided to consider the value as 0.18 to avoid complexity created by many minor relations. Based on the matrix values which are greater than or equals to 0.18 in Table G4 in Appendix G; following the construction of Figure 3.3, an impact relation diagram was drawn, and the cause and effect relationships among these factors are shown in Figure 4.1. The factors F9, F13, F28, F33, F6 and F2 are influenced by many factors while F25, F26, F27 and F33 are influential for many factors. F33 (apply the full set of lean principles and tools) seems very critical.

Following the construction of Figure 3.4, the IRM is constructed by mapping all coordinate sets of r+c and r-c in below Figure 4.2. The map clearly shows that 10 factors with a prominence level higher than 8.57 and have fallen into the fourth quadrant are the most influential points in the frame, hence may be considered as critical. This group includes in order of prominence F33, F34, F27, F22, F8, F25, F21, F31, F32, and F23. These factors will be justified based on element wise DEMATEL results while the factors F4, F5, F15, F19 and F26 which have r+c value very close to average r+c will be checked whether they fall in critical category as per element wise DEMATEL analysis. By the way, as F2 has the highest r-c i.e. the greatest negative net-effect scores than other factors; factors F25 and F33 which have effect on F2 may need to be initially addressed. One interesting result is that as per decided threshold value, the critical factor F31 is not showing effect on any factor.

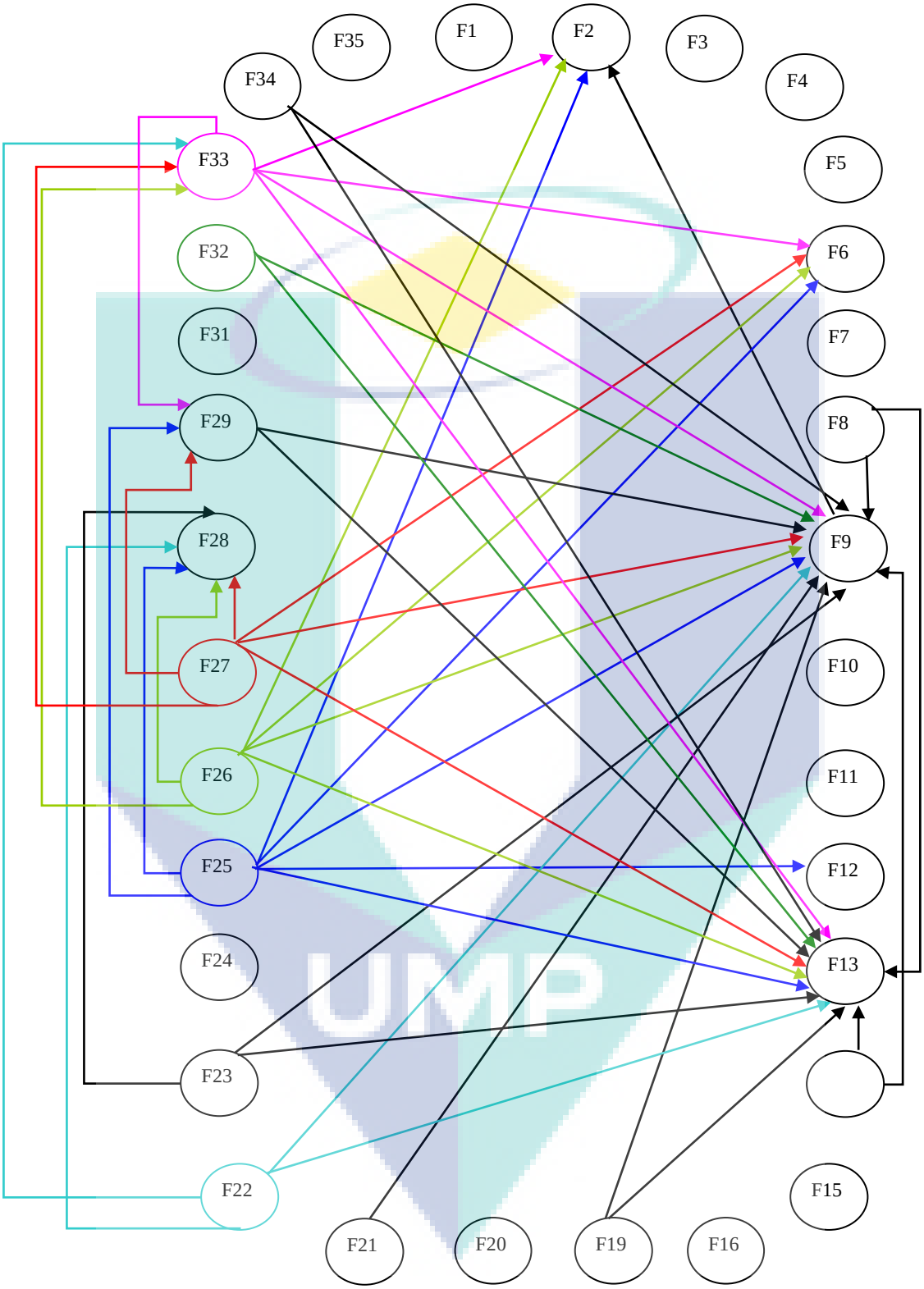

Figure 4.1 Impact Relation Diagram of Selected Factors

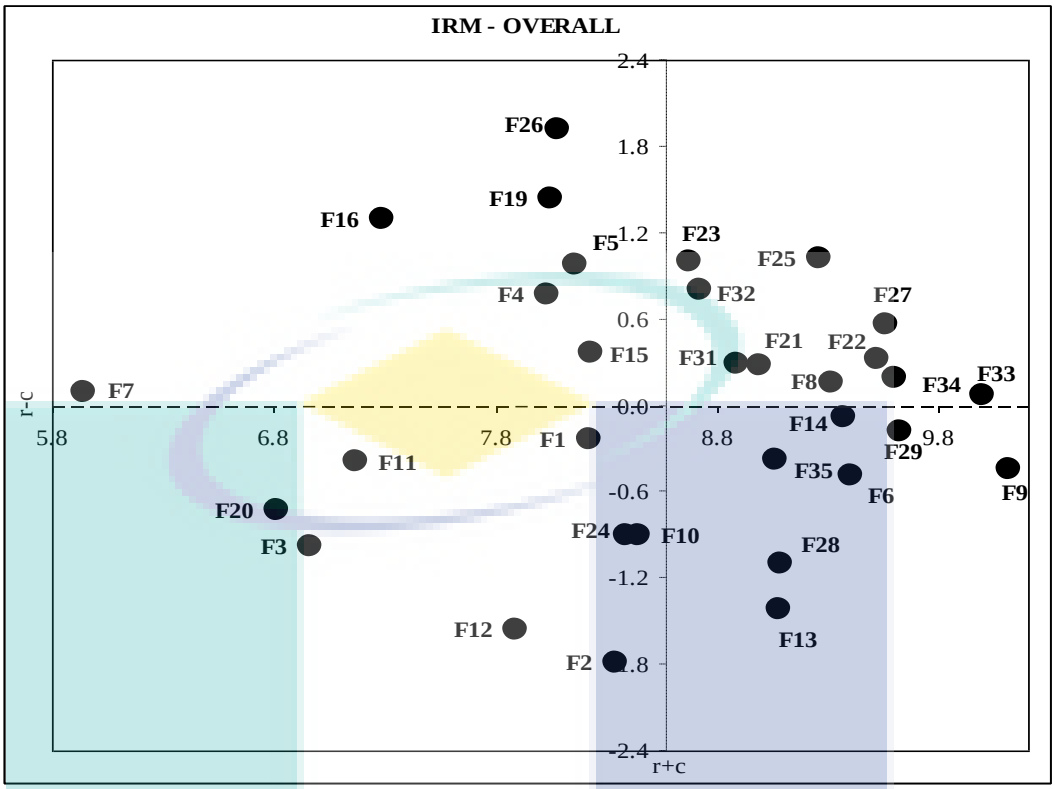

Figure 4.2 Impact Relation Map of Selected Factors

4.4 Analysis of Element wise Factors Using DEMATEL

SFs which have score between 3 (highly relevant) and 4 (extremely relevant) for the elements of PSPs of lean are selected for the specific element to analyze to identify criticality. To fulfil third research objective, following the exact same method of DEMATEL from step one to step six (described in sub-section 3.6.2 and used in last section 4.3 to analyze all factors together), the selected SFs for all elements are analysed separately. Average matrix, D matrix, T matrix for all element wise factors are given in Appendix H and listed in Table 4.3 including calculated α, decided α and mean r+c value.: Based on decided alpha 1.81, the impact relation diagram is drawn as shown in Figure 4.3 indicates that F21 receives impact from maximum number of factors whereas F4, F8 and F14 are influencing more number of factors. The IRM is drawn as in Figure 4.4. Based on mean r+c value 16.97, from the first quadrant of the inter relation map, we may decide that F4 (Human resource empowerment), F8 (Organizational culture) and F14 (Engagement process owners) are critical for the implementation of element E1 (Use reliable data) of PSPs of lean.

Table 4.3 Analysis of Element wise Factors Using DEMATEL

Element of PSPs	Average matrix	D matrix	T matrix analysis	Calculated α	Decided α	Mean r+c
E1	Table H1	Table H2	Table H3	1.81	1.81	16.97
E2	Table H4	Table H5	Table H6	0.31	0.38	9.30
E3	Table H7	Table H8	Table H9	0.25	0.30	8.11
E4	Table H10	Table H11	Table H12	0.21	0.27	8.11
E5	Table H13	Table H14	Table H15	1.03	1.03	14.35
E6	Table H16	Table H17	Table H18	0.88	0.88	12.31
E7	Table H19	Table H20	Table H21	0.43	0.43	6.85
E8	Table H22	Table H23	Table H24	0.23	0.27	8.58
E9	Table H25	Table H26	Table H27	0.38	0.43	10.64
E10	Table H28	Table H29	Table H30	0.35	0.40	7.74

Also we have found in cause and effect diagram that all these three factors have effect on each other; hence addressing these factors will be gradually easier. Again, as F14 has both the highest r+c and r-c values among the three critical factors, engaging process owners is the most critical factor in using reliable data successfully in problem solving.

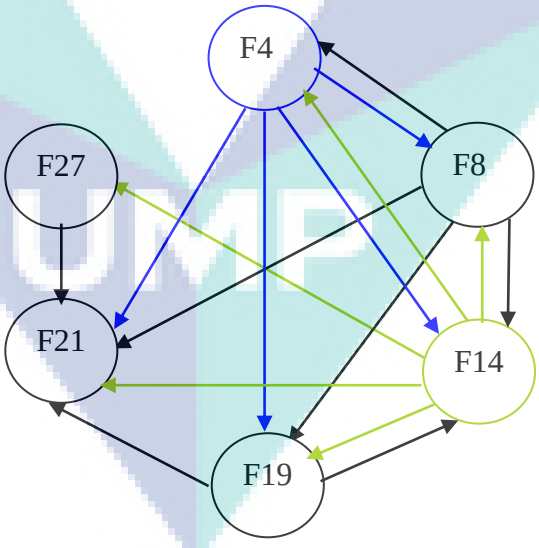

Figure 4.3 Impact Relation Diagram for Element 1

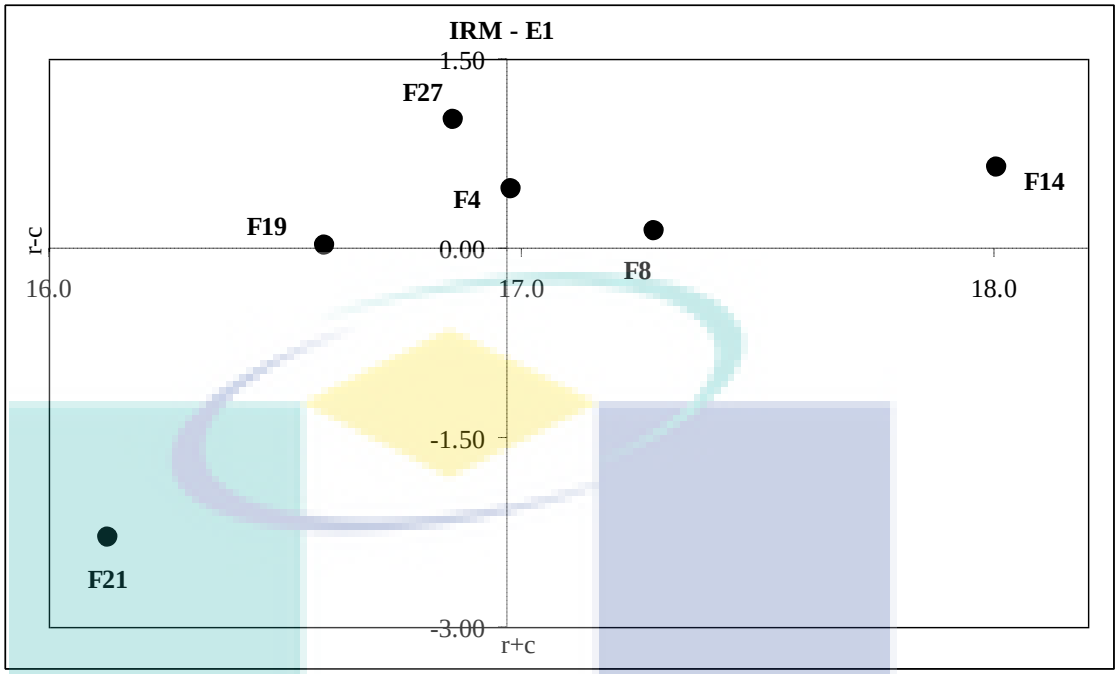

Figure 4.4 Impact Relation Map for Element 1

Based on decided alpha 0.38, the impact relation diagram is drawn as shown in Figure 4.5 indicates that F21, F28 and F29 receive impact from maximum number of factors whereas F19, F22, F25 and F33 are influencing more number of factors. The IRM is drawn as in Figure 4.6. Based on mean r+c value 9.30, from the first quadrant of the inter relation map, we may decide that F14 (Engagement process owners), F25 (Metrics and accountability) and F33 (Apply the full set of LPs and tools) are critical for the implementation of element E2 (Structure problem solving procedure). F19 (Understand the process) from second quadrant is also considered as critical for element 2, because it is very close to mean r+c and has effects on five other factors as per impact relation diagram. Process owners, who are engaged in the process all the time, know and understand the best about the process. Hence they can suggest how the structure should be and evaluate any improvement. Also, metrics help to evaluate whether the structure of the process is really working in favor of better results. Understanding the process is the first and foremost factor to initiate any change in the structure of the process.

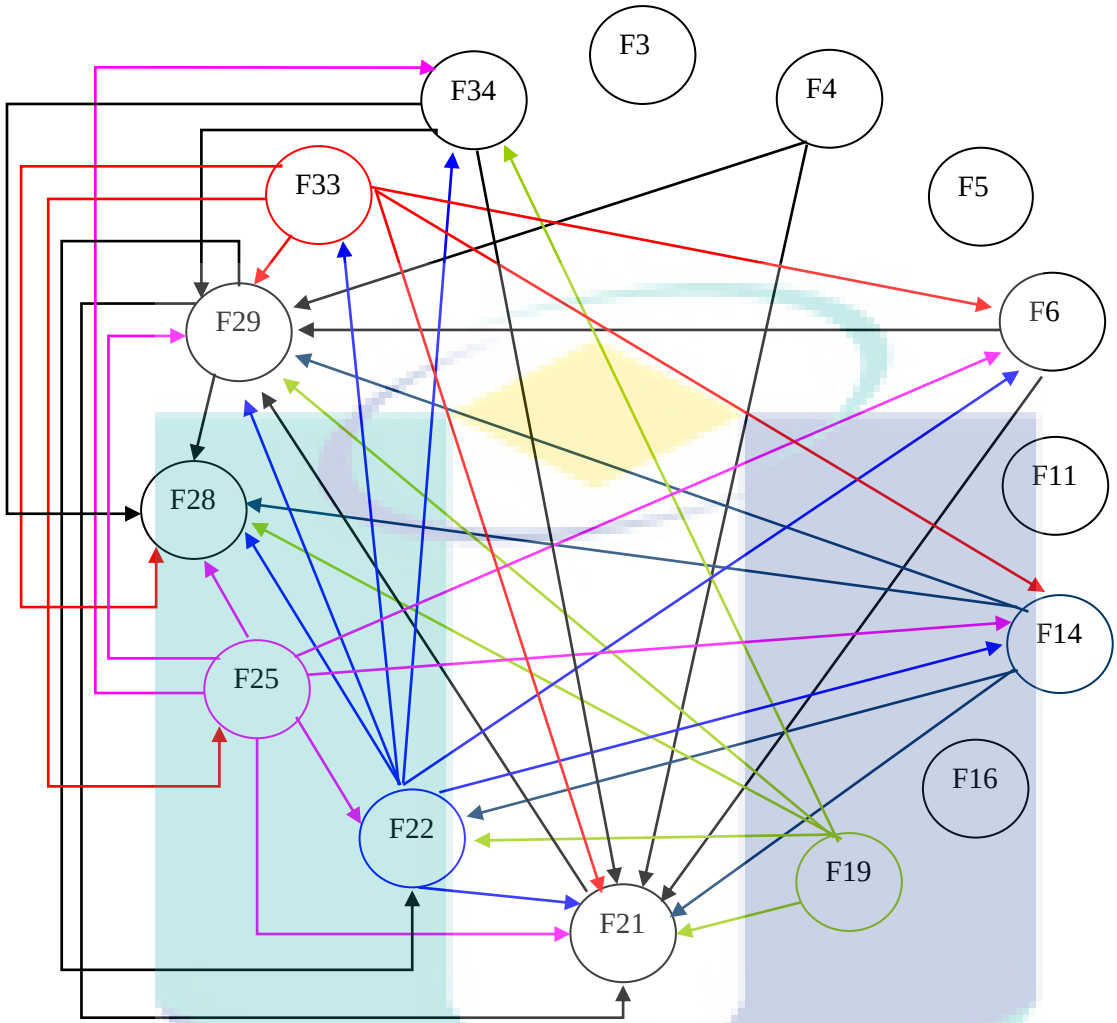

Figure 4.5 Impact Relation Diagram for Element 2

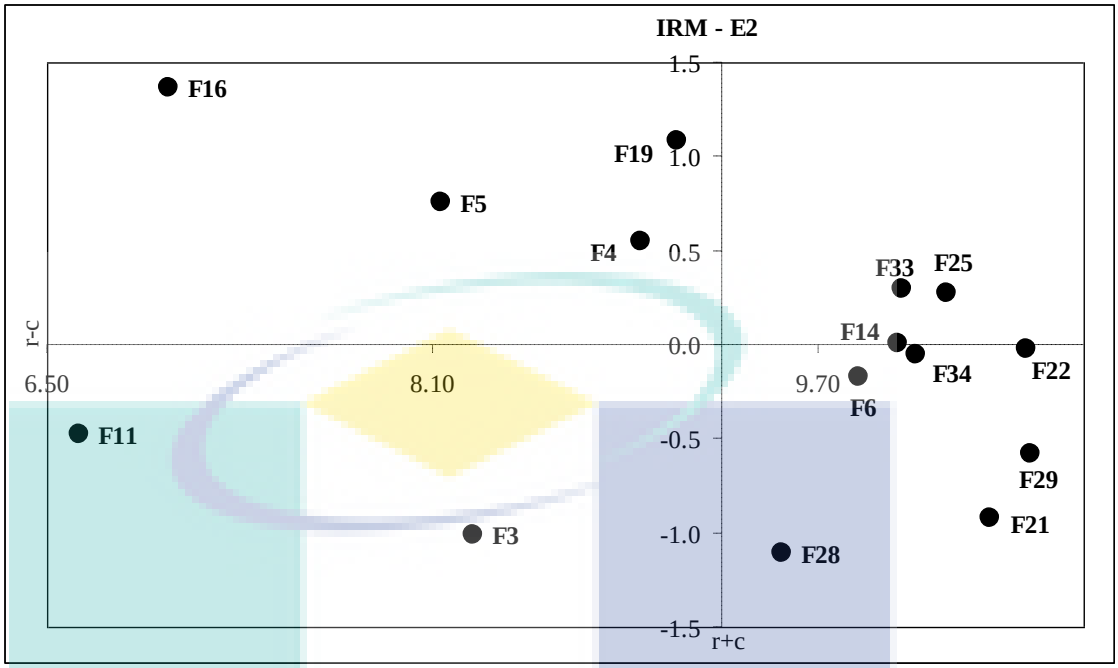

Figure 4.6 Impact Relation Map for Element 2

With decided alpha 0.30, the impact relation diagram is drawn as shown in Figure 4.7 indicates that F9, F14, F28, F34 and F35 receive impact from maximum number of factors whereas F19, F22, F23, F25 and F29 are influencing more number of factors. The IRM is drawn as in Figure 4.8. Based on mean r+c value 8.11, from the first quadrant of the inter relation map, we may confirm that not only the factors F14 (Engagement process owners), F19 (Understand the process), F22 (Teamwork), F25 (Metrics and accountability), F29 (Motivation) and F33 (Apply the full set of LPs and tools) are critical for the implementation of element E3 (root causes and alternative solutions) of PSPs of lean; but also the factor F23 (Right kind of training) from second quadrant may be considered as critical, as it is very close to mean r+c and have effects on several factors.

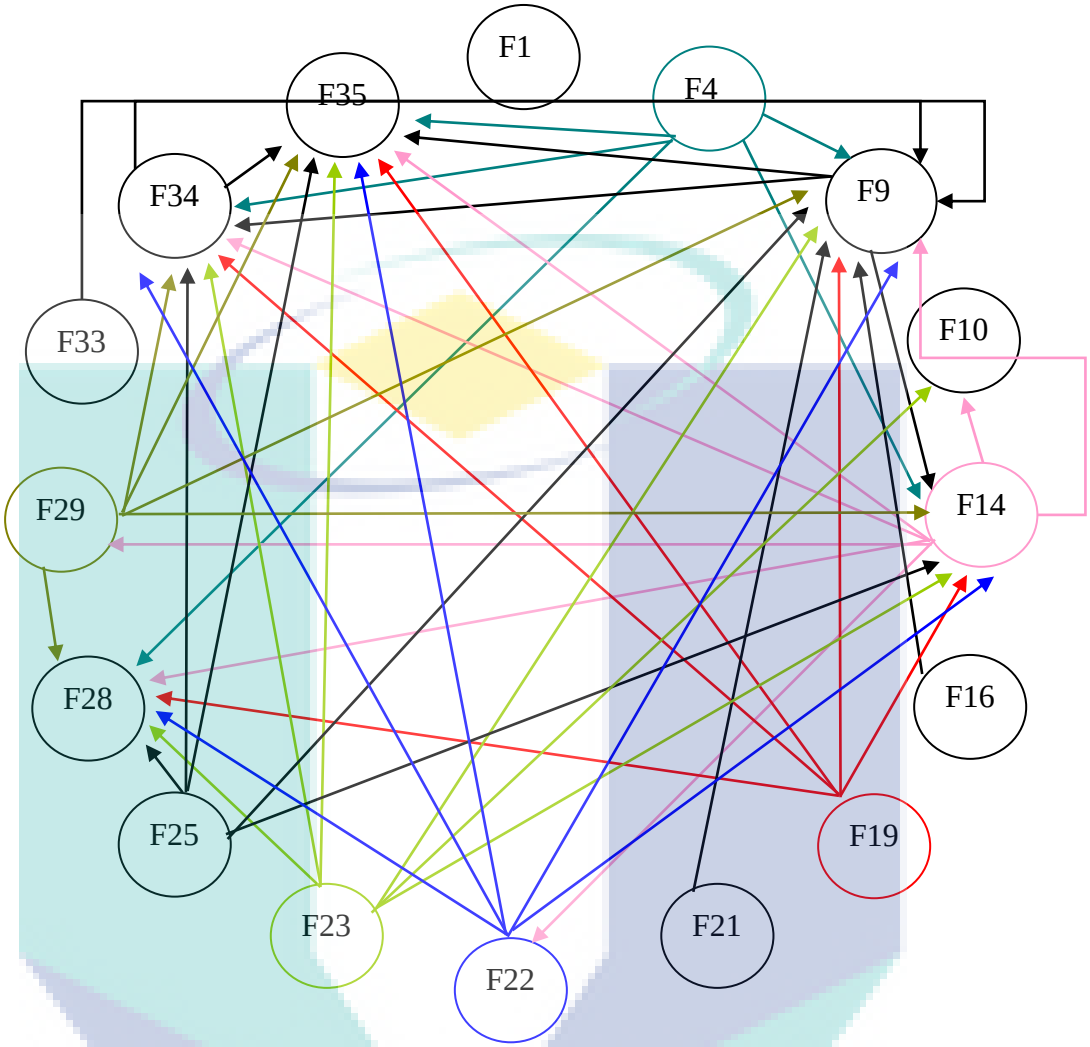

Figure 4.7 Impact Relation Diagram for Element 3

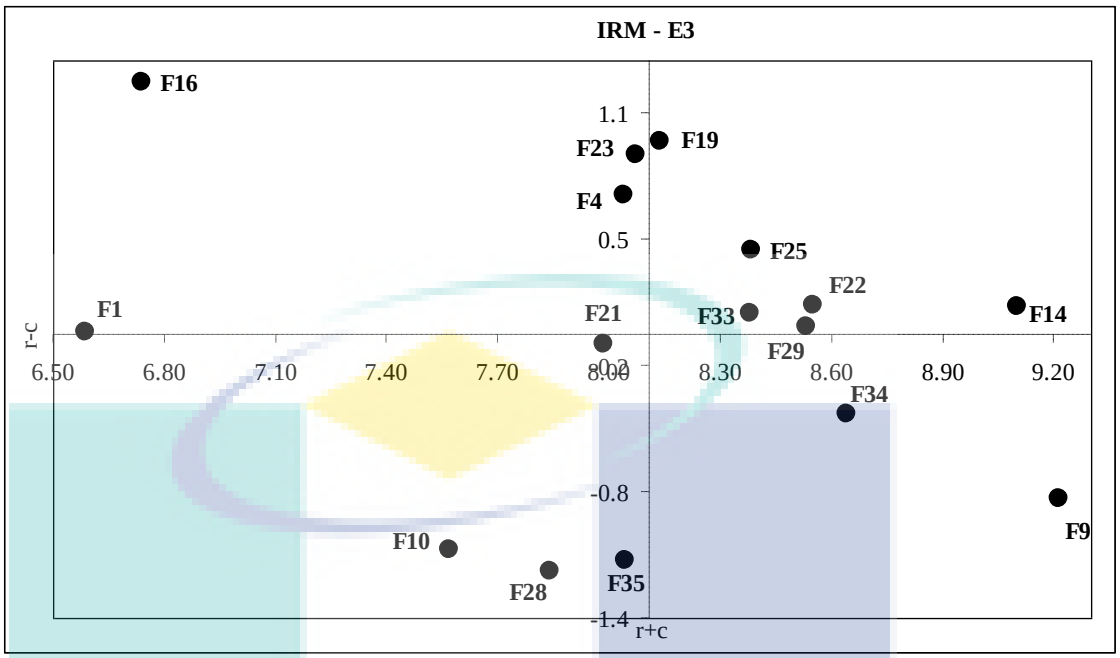

Figure 4.8 Impact Relation Map for Element 3

These results from impact relation diagram and map can be interpreted as: for sure, in most of the cases, the process owners are the best persons to find the root causes, because they understand the process most. To analyse the causes and find the alternation solutions, the team members need to understand the process and for this, they could be provided appropriate and adequate training. Testing the solutions should be monitored as per metrics and the justification should be done by applying all tools together with principles maintained. For this massive activity, motivation for employees plays a critical role as well. Also we have found in cause and effect diagram that engagement process owner has with mutual effect on teamwork and motivation; hence addressing these factors will be gradually easier and F14 should be given priority.

Based on decided alpha 0.27, the impact relation diagram is drawn as shown in Figure 4.9 indicates that F9, F13, F28 and F34 receive impact from maximum number of factors whereas F22, F23 and F25 are influencing more number of factors. The IRM is drawn as in Figure 4.10. Based on mean r+c value 8.11, from the first quadrant of the inter relation map, we may decide that along with factors F14 (Engagement process owners), F22 (Teamwork), F25 (Metrics

and accountability), F29 (Motivation), F33 (Apply the full set of LPs and tools) and F34 (Quality awareness and management) from the first quadrant of the map; the factor F23 (Right kind of training) in second quadrant is also considered as critical for element 4 (Implement quickly) of PSPs of lean because its very close to mean r+c and have effects on many factors. As an explanation, it is obvious that missing of some principles and tools will delay the implementation process. Appropriate training on all relevant tools and techniques which emphasizes quality awareness is highly required to apply new solutions. Building teams together with process owners and keeping them motivated and accountable with the evidence of key results and performance measurements are highly recommended as well. Also the researcher have found in cause and effect diagram that F29 has mutual effects with F33 and F34; hence addressing these factors will be gradually easier and factor F29 should have priority.

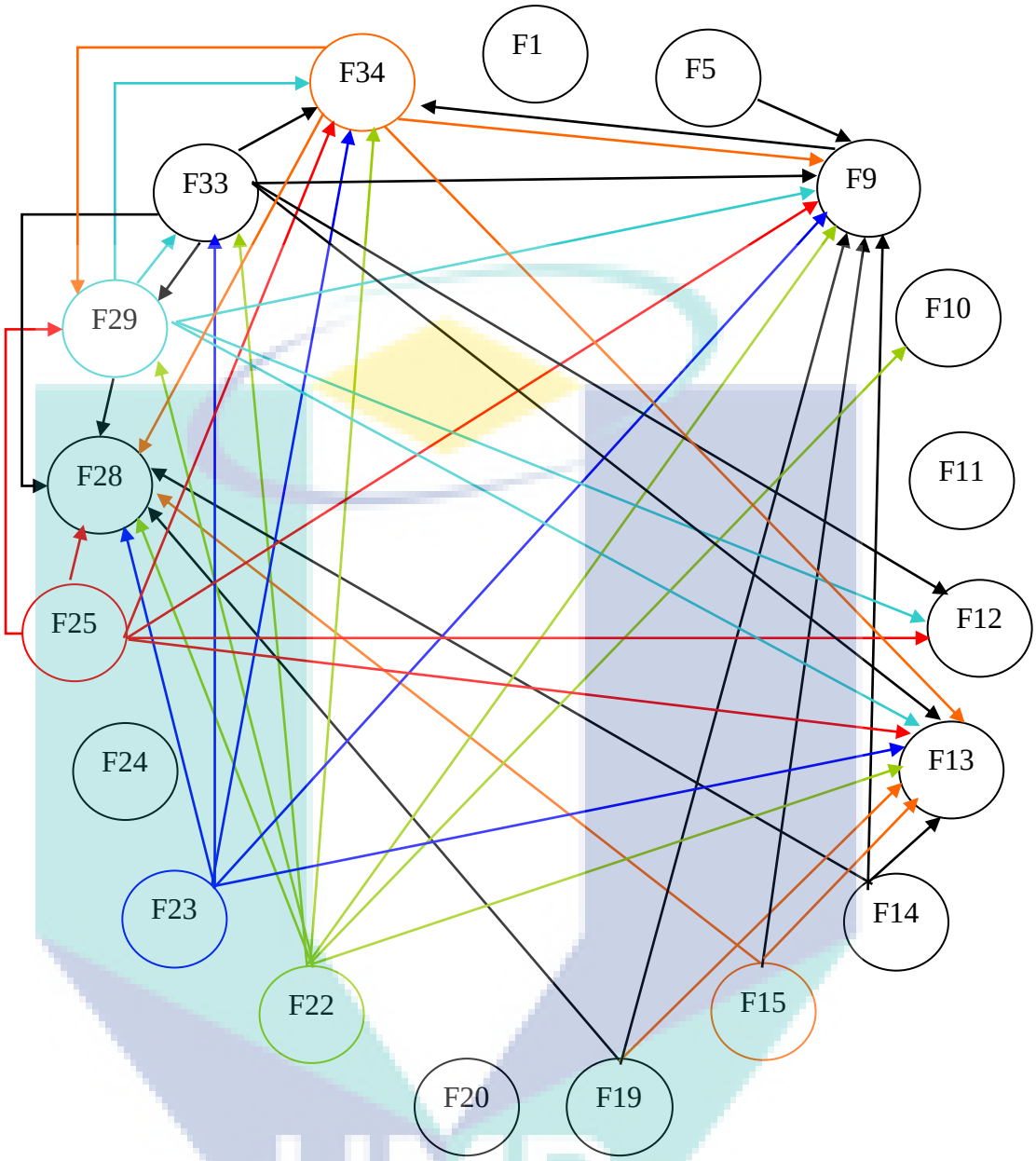

Figure 4.9 Impact Relation Diagram for Element 4

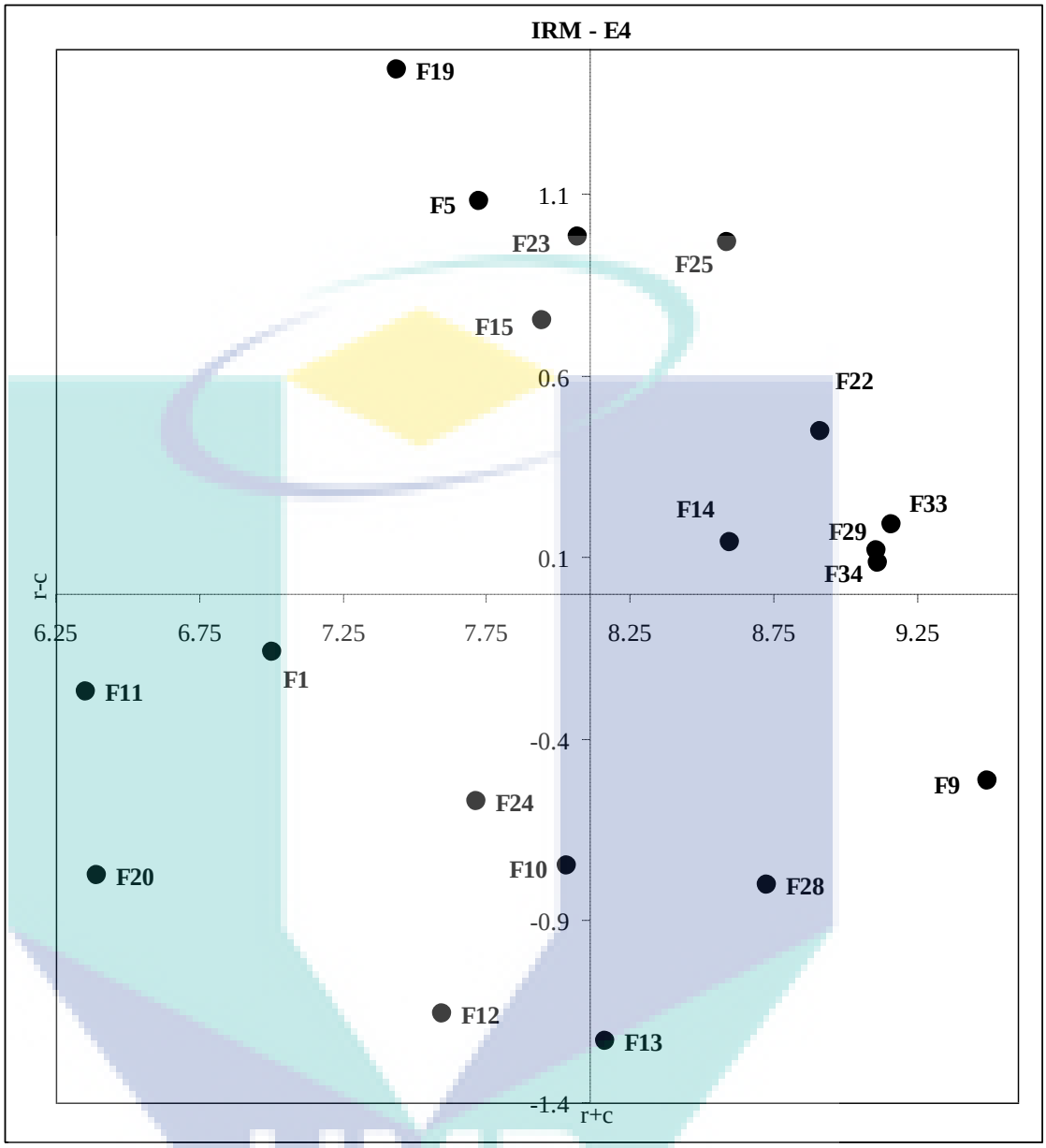

Figure 4.10 Impact Relation Map for Element 4

With decided alpha 1.03, the impact relation diagram is drawn as shown in Figure 4.11 indicates that F10, F21 and F34 receive impact from maximum number of factors whereas F4, F8 and F29 are influencing more number of factors. The IRM is drawn as in Figure 4.12. Based on mean r+c value 14.35, from the first quadrant of the inter relation map, we may decide that are F8 (Organizational culture), F14 (Engagement process owners), F29 (Motivation) are critical for element E5 (Make problems visible) of PSPs of lean. If the culture of

the organization does not create fear of losing job or even being insulted, the employees will bring problems to the surface, and those, who work on the process, the nearest and most aware of issues with the process, can highlight problems quickly. Motivation is also required to have this principle practiced. Also we have found in cause and effect diagram that F14 and F29 have effect on each other; hence addressing these factors will be gradually easier. Again F14 has effect on itself; hence it would the easiest and/or quickest factor to be improved.

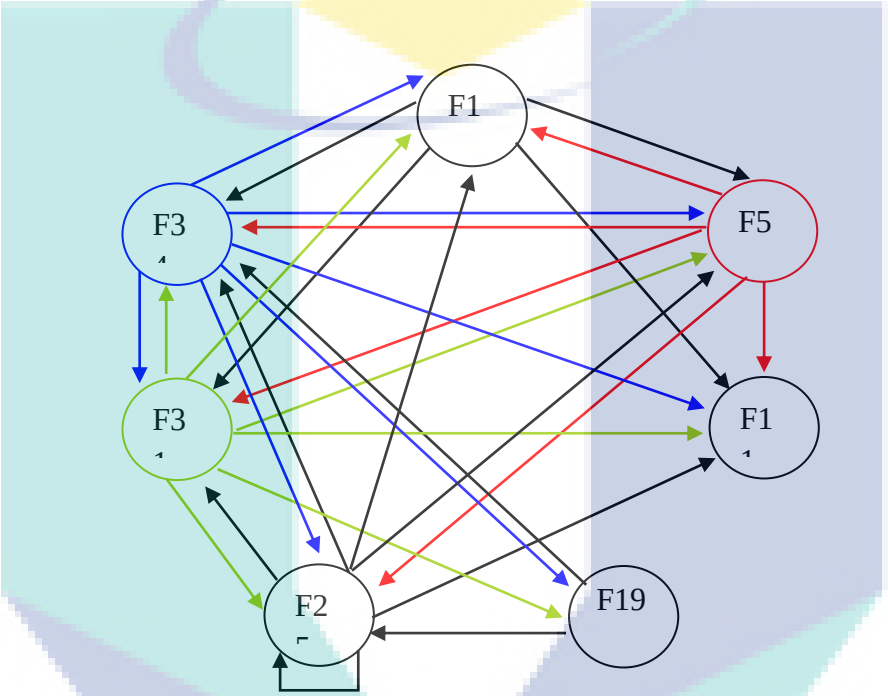

Figure 4.11 Impact Relation Diagram for Element 5

Having decided alpha 0.88, the impact relation diagram is drawn as shown in Figure 4.13 indicates that F11, F25 and F34 receive impact from maximum number of factors whereas F5, F25, F31 and F34 are influencing more number of factors. As F25 and F34 have impacts given to and taken from more number of factors, they are expected to be critical. The IRM is drawn as in Figure 4.14. Based on mean r+c value 12.31, from the first quadrant of the inter relation map, we may confirm that those two factors F25 (Metrics and accountability) and F34 (Quality and management) are critical to E6 (approach problems categorically) of PSPs of lean.

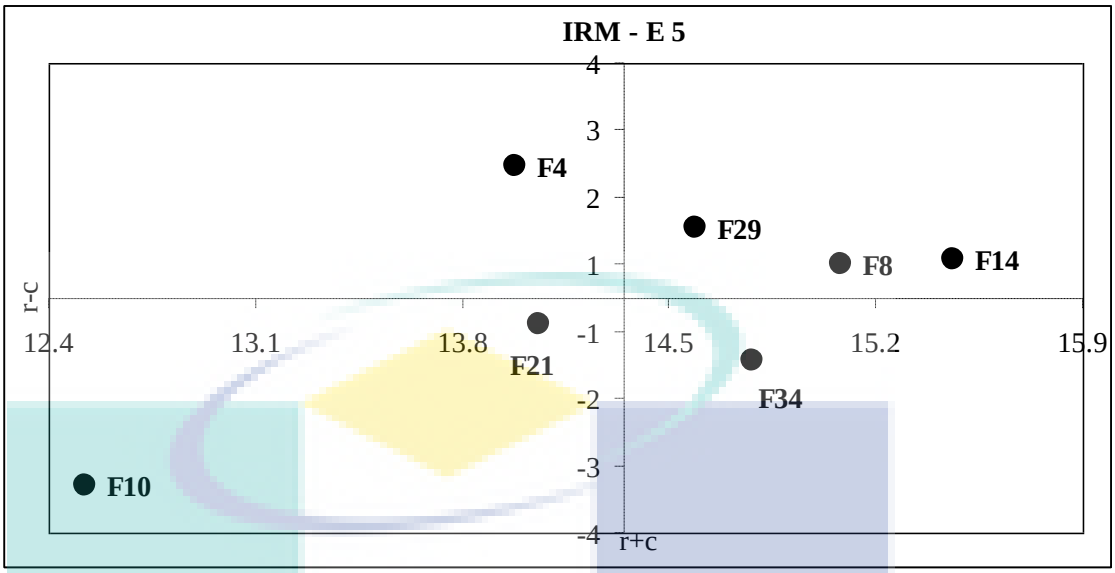

Figure 4.12 Impact Relation Map for Element 5

Metrics of performance measurement shows which processes are performing and which are facing problems, and also the responsible personnel can share the issues with accountability followed by categorization of problems as per importance of quality and level of difficulty to manage them. Also we have found in cause and effect diagram that these two factors have effect on each other; hence addressing these factors will be gradually easier and/or faster. As the factor of metrics and accountability has the highest r+c and r-c values, it is the most critical factor to categorize problems such as urgent.

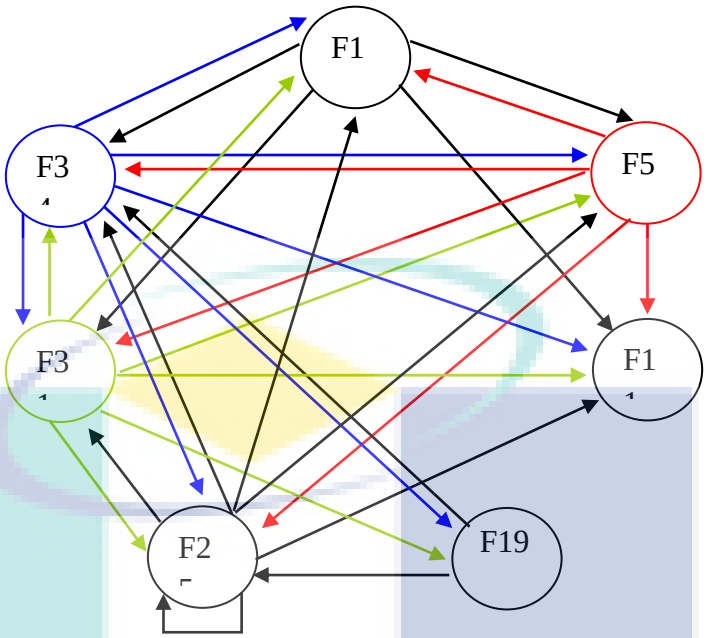

Figure 4.13 Impact Relation Diagram for Element 6

Based on decided alpha 0.43, the impact relation diagram is drawn as shown in Figure 4.15 indicates that F8, F10, F15, F22 and F29 receive impact from maximum number of factors whereas F4, F22, F29 and F32 are influencing more number of factors. As F22 and F29 have impacts given to and taken from more number of factors, they are expected to be critical. The IRM is drawn as in Figure 4.16. Based on mean r+c value 6.85, from the first quadrant of the inter relation map, we may confirm that F15 (New knowledge and mindset) and F29 (Motivation) are critical for the implementation of element E7 (Reflect mistakes and standardize processes) of PSPs of lean.Motivation is critical to disclose mistakes while mindset and learning from mistakes are in a reinforcing loop; and employees with proper mindset and adequate knowledge will always take the process to a new standard. Factor F29 has the higher r+c and r-c values; hence, it is the most critical factor. Without motivation, no one will disclose the mistakes. Also we have found in impact relation diagram that these factors have effect on each other; hence addressing these factors will be gradually easier and/or faster.

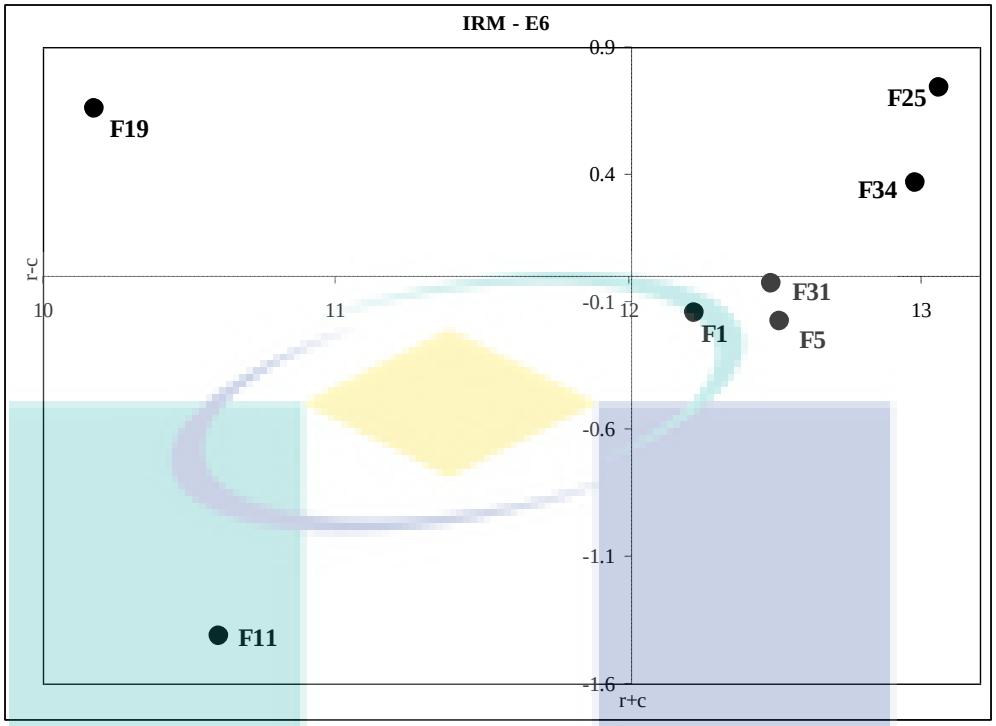

Figure 4.14 Impact Relation Map for Element 6

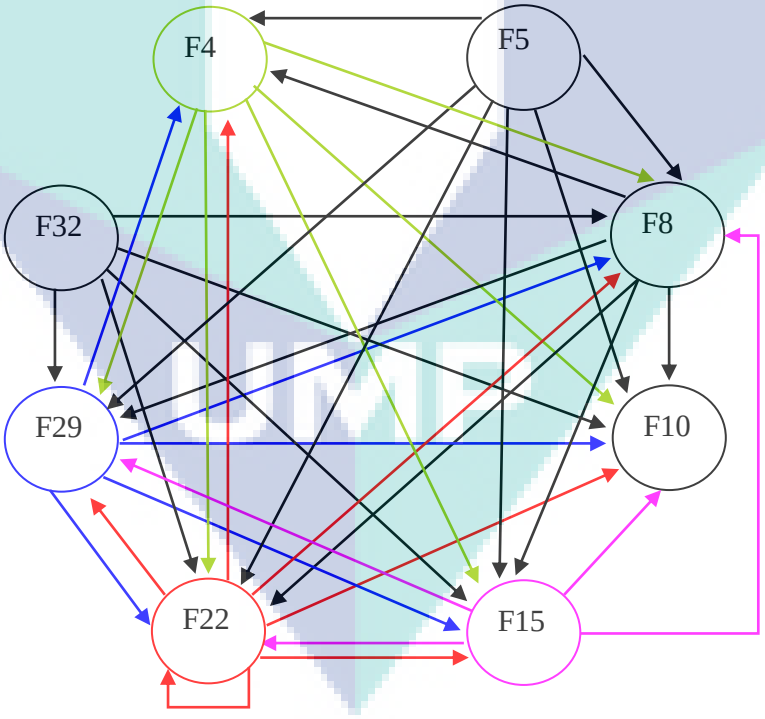

Figure 4.15 Impact Relation Diagram for Element 7

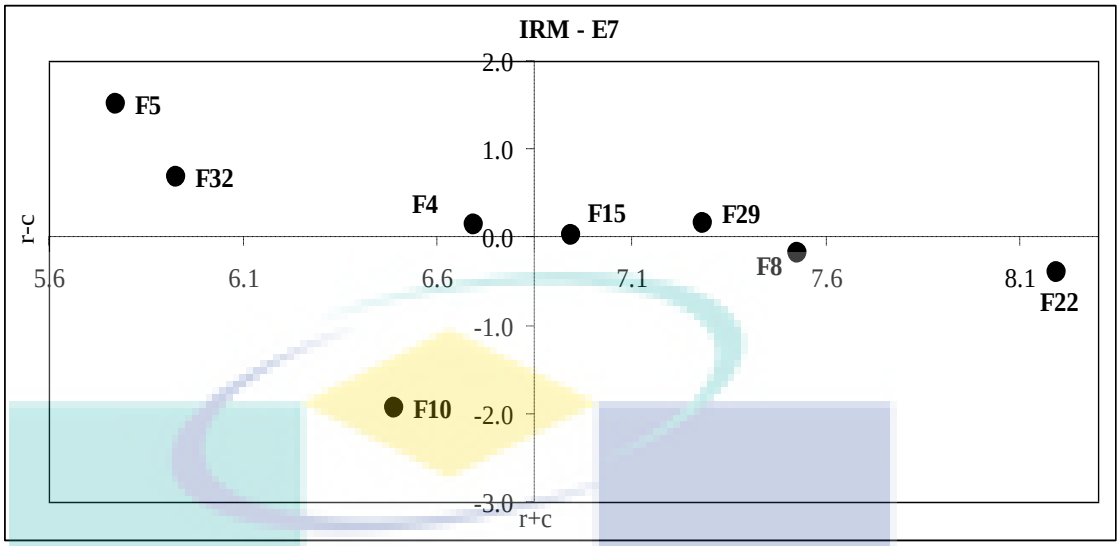

Figure 4.16 Impact Relation Map for Element 7

With decided alpha 0.27, the impact relation diagram is drawn as shown in Figure 4.17 indicates that F2, F9, F10, F14 and F33 receive impact from maximum number of factors whereas F21, F22, F25 and F29 are influencing more number of factors. The IRM is drawn as in Figure 4.18. Based on mean r+c value 8.58, from the first quadrant of the inter relation map, we may decide that are Factors F6 (Leadership from top management), F8 (Organizational culture), F21 (Effective communication), F22 (Teamwork), F25 (Metrics and accountability) and F29 (Motivation) highly important and contributing to the element E8 (Encourage Continuous improvement) of PSPs of lean. Encouragement for continuous improvement should start strongly from top management and gradually embed into the company culture. Sharing and active discussion on metrics on the team can keep employees highly motivated for thinking and efforts for improvement.

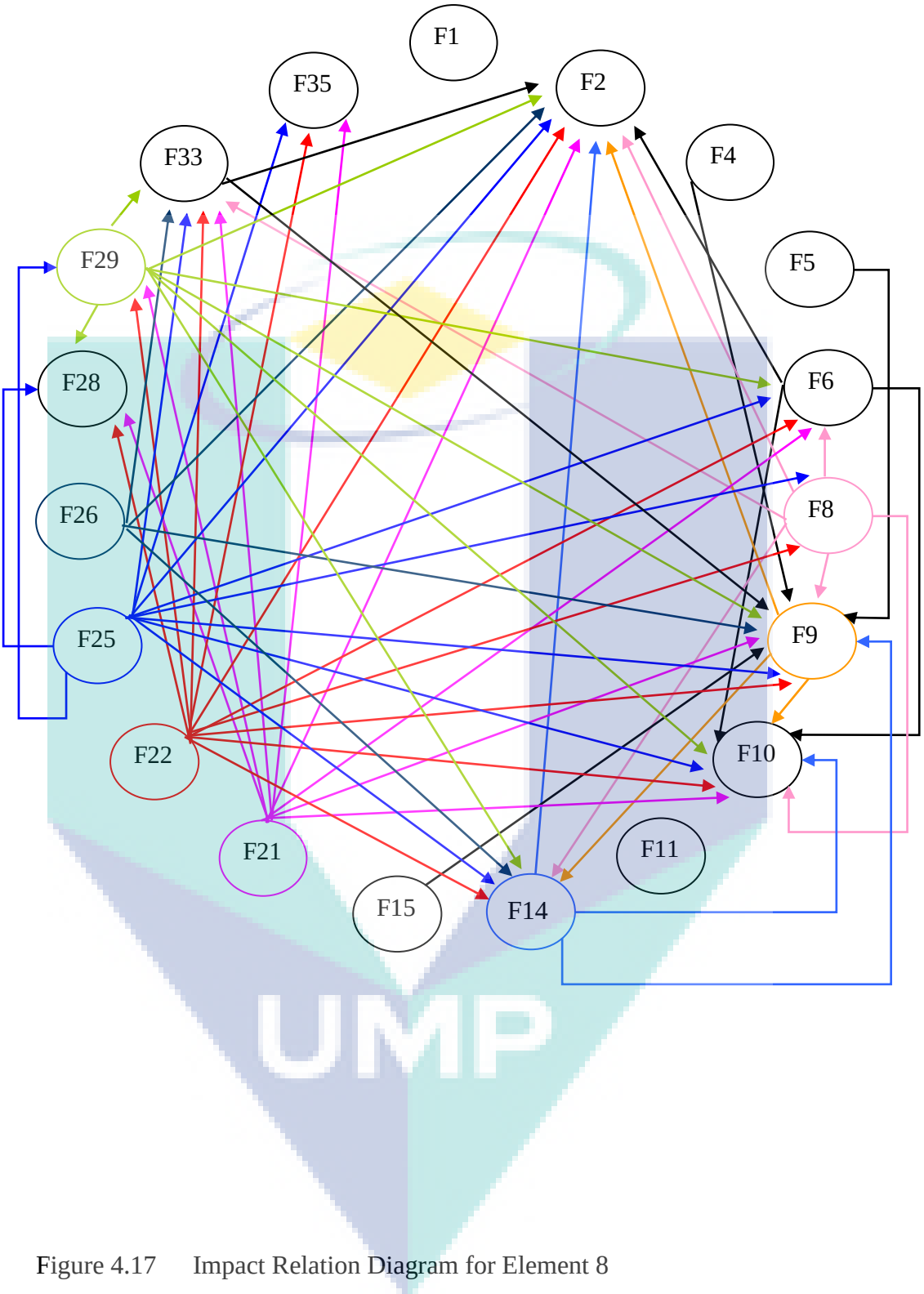

Figure 4.17 Impact Relation Diagram for Element 8

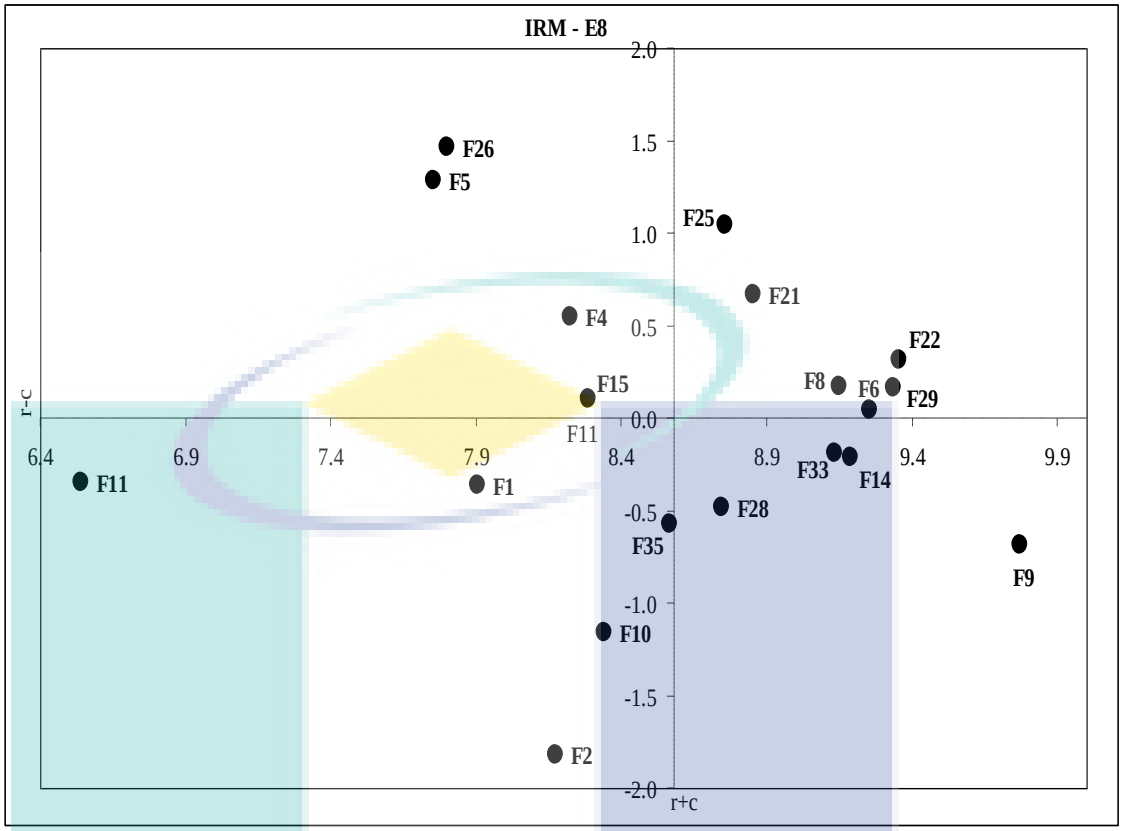

Figure 4.18 Impact Relation Map for Element 8

As of decided alpha 0.43, the impact relation diagram is drawn as shown in Figure 4.19 indicates that F6, F12, F29, F33 and F34 receive impact from maximum number of factors whereas F5, F6, F22, F26 and F27 are influencing more number of factors. F6 is influencing more numbers of factors and also getting influences from more number of factors; hence it is expected to be in the list of critical success factors. The IRM is drawn as in Figure 4.20. Based on mean r+c value 10.64, from the first quadrant of the inter relation map, we may confirm that F5 (Compelling need to change), F8 (Organizational culture), F22 (Teamwork), F27 (Extend beyond production & to suppliers) and F29 (Motivation) are critical for E9 (Best Practice & strengthening) of PSPs of lean. F22 and F29 have effect on each other; hence addressing these factors will be gradually easier and/ or faster.

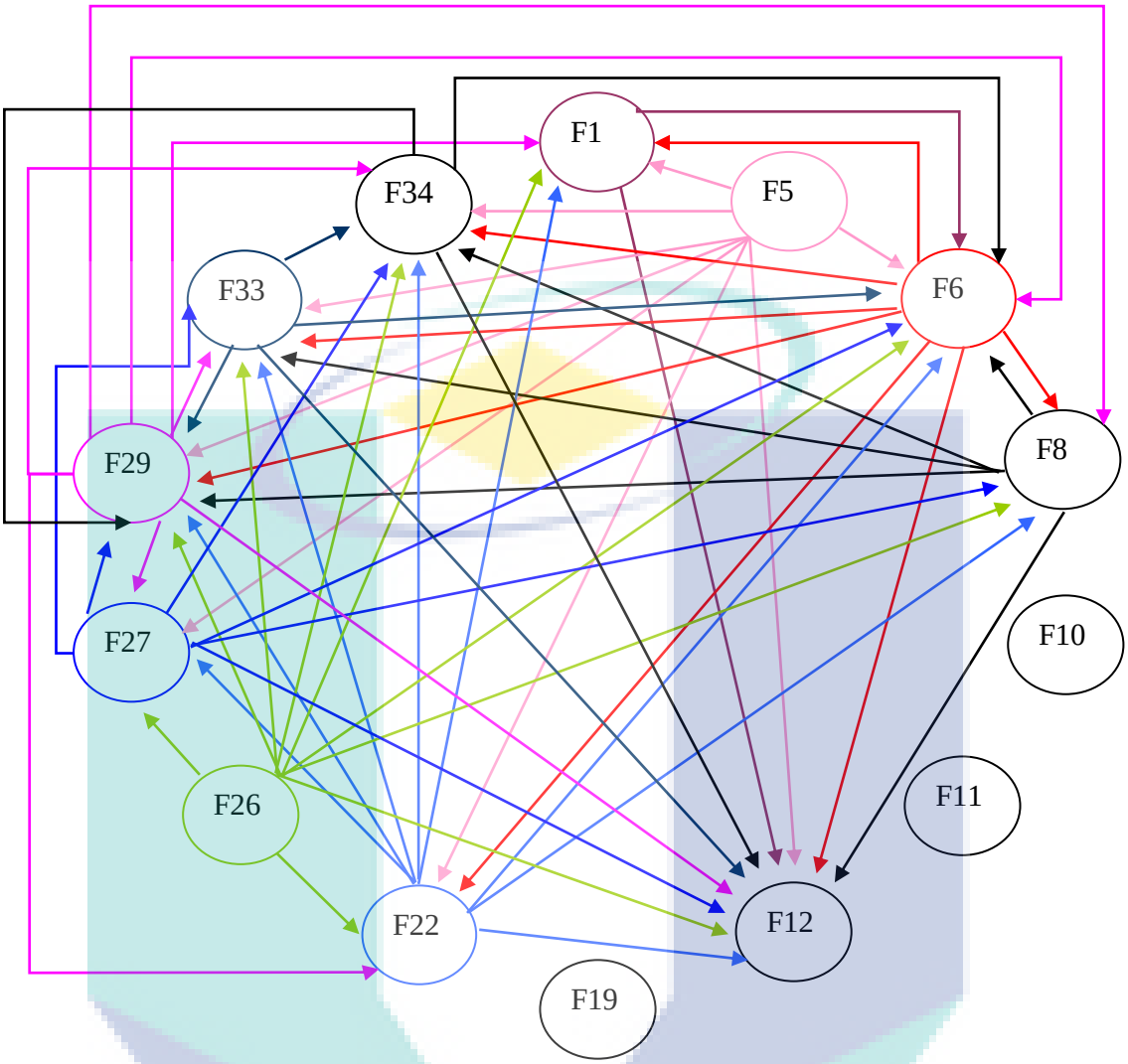

Figure 4.19 Impact Relation Diagram for Element 9

When changes are undeniable and the culture of organization is appreciating to the continuous changes for better, the employees of all departments inclusive suppliers' side as partners get the team spirit to further strengthen the process with the available best practices. Also we have found in cause and effect diagram that

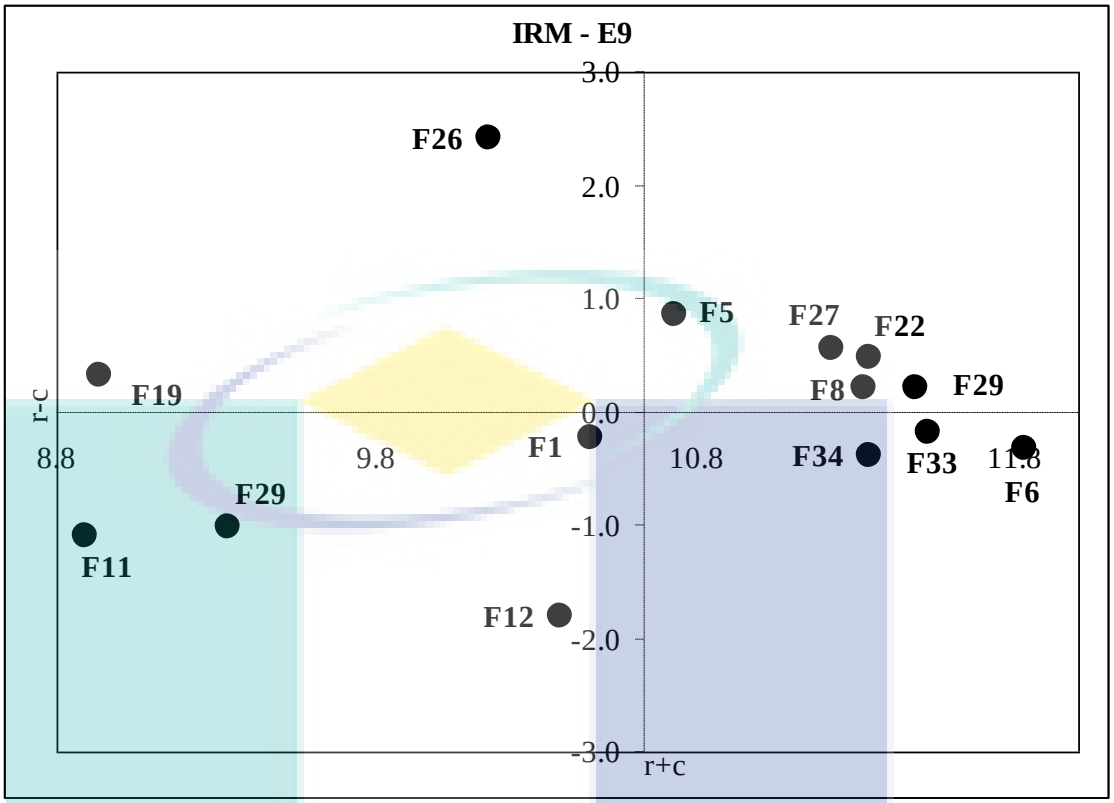

Figure 4.20 Impact Relation Map for Element 9

With decided alpha 0.40, the impact relation diagram is drawn as shown in Figure 4.21 indicates that F1, F2, F3 and F6 receives impact from maximum number of factors whereas F6, F25, F29 and F31 are influencing more number of factors. F6 is influencing more numbers of factors and also getting influences from more number of factors; hence it is expected to be in the list of critical success factors. The IRM is drawn as in Figure 4.23. Based on mean r+c value 7.74, from the first quadrant of the inter relation map, we may confirm that in addition to F6 (Leadership from top management), F29 (Motivation) and F31 (Business strategy) in first quadrant; from second quadrant, the factor F25 (Metrics and accountability) is also considered as critical for element 10 (Knowledge protection), because it is very close to mean r+c and have effects on many factors of PSPs of lean. Among these four critical factors, F31 has the highest r+c and r-c values; hence, undoubtedly, business strategy is the most critical success factors to protect knowledge in the company. When top management sets long term business strategy to keep experienced employees motivated to achieve to achieve better results and accountable for their results in a

meaningful way, the employees do not switch the company, and the company enjoys their continuous contribution with increased knowledge and expertise. Also we have found in cause and effect diagram that F6 has mutual impacts on F29 and F31; hence addressing these factors will be gradually easier, and F6 should be given priority.

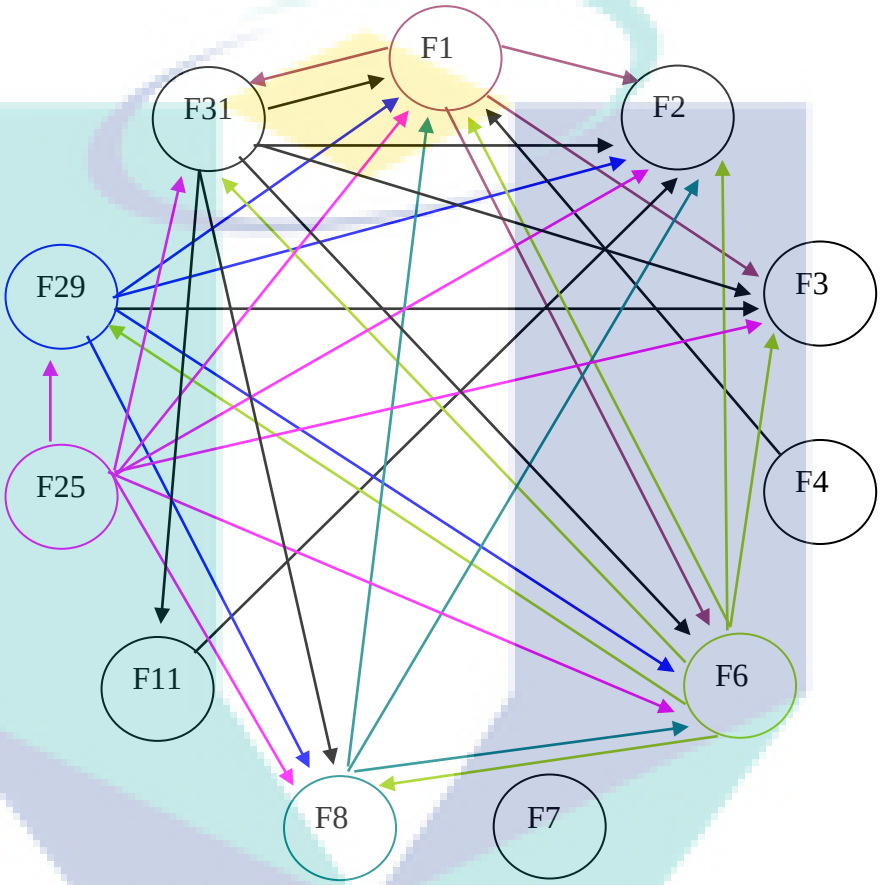

Figure 4.21 Impact Relation Diagram for Element 10

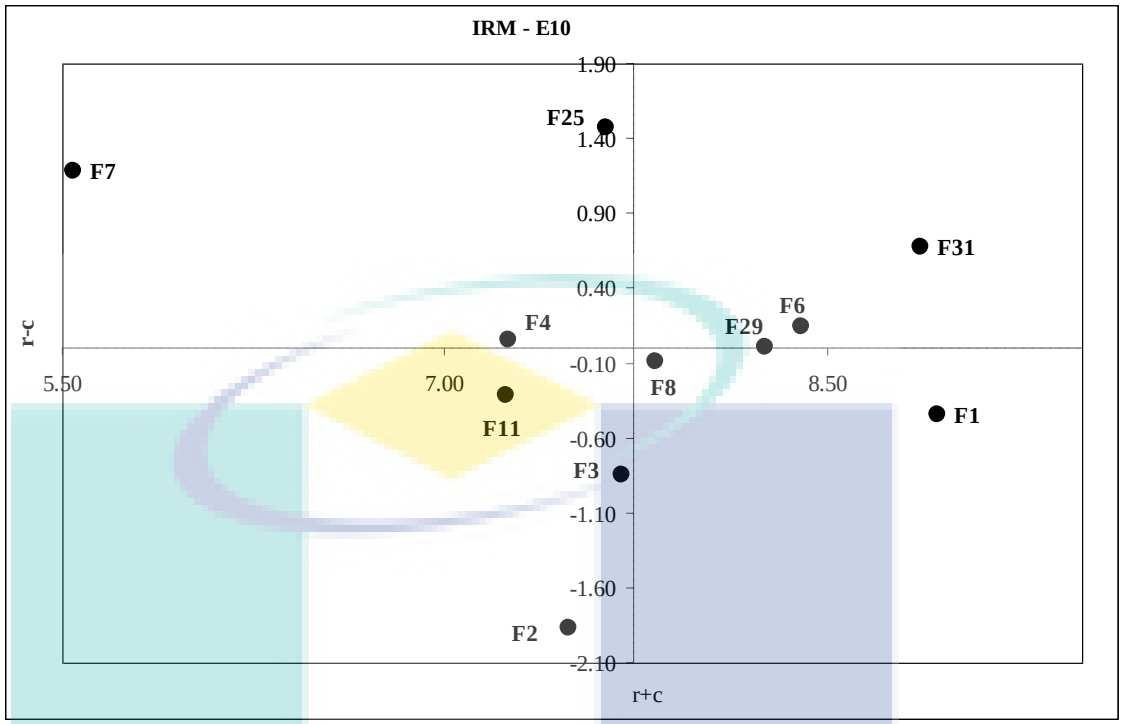

Figure 4.22 Impact Relation Map for Element 10

4.5 Combined Result from Overall and Element Wise Analysis

To fulfill third research objective of this research, the has author has constructed Table 4.4 to finalize the list of CSFs for the implementation of PSPs of lean based on both approach of analyzing SFs relation and prominence altogether and separately by DEMATEL. Factors F8, F21, F22, F23, F25, F27, F31, F33 and F34 are found commonly critical in both approaches. Additionally, F4, F5, F6, F14, F15, F19 and F29 are critical as per individual element wise studies. F32 seemed critical in overall calculation, has not appear as critical for any individual element. But it is a factor applicable for overall implementation only; hence it is taken as critical factor. Quite interestingly, F4, F14, F29 and F33 are found critical for more than one element in element wise analysis but not found as critical in overall calculation.

Table 4.4 Critical Factors as per Combined Approach

Elements	F4 - Human resource empowerment	F5 - Compelling need to change	F6 - Leadership from top management	F8 - Organizational culture	F14 - Engagement of process owners	F15 - New knowledge and mindset	F19 - Understand the process	F21 - Effective communication	F22 - Teamwork	F23 - Right kind of training	F25 - Metrics and accountability	F27 - Extend beyond production & to suppliers	F29 - Motivation	F31 - Business strategy	F32 - Detailed Implementation plan	F33 - Apply the full set of LPs and tools	F34 - Quality awareness and management
E1 - Use reliable data	X			X	X												
E2 - Standardize problem solving procedure					X		X				X					X	
E3 - Root causes & alternative solutions					X		X		X	X	X		X			X	
E4 - Implement quickly					X				X	X	X		X			X	X
E5 - Make problems visible				X	X								X				
E6 - Approach problems categorically											X						X
E7 - Reflect mistakes & standardize processes						X							X				
E8 - Encourage Continuous improvement			X	X				X	X		X		X				
E9 - Best Practice & strengthening		X		X					X			X	X				
E10 - Knowledge protection			X								X		X	X			
All elements together				X				X	X	X	X	X		X	X	X	X
No. of total hits	1	1	2	5	5	1	2	2	5	3	7	2	7	2	1	4	3

4.6 Building a Framework

The critical factors found for PSPs of lean are, finally, validated by the same experts from the automotive industry participated in focus group and pair wise comparison of SFs. To fulfill fourth research objective, as a summary, based on the 17 CSFs for elements of PSPs of lean: F4, F5, F6, F8, F14, F15, F19, F21, F22, F23, F25, F27, F29, F31, F32, F33 and F34, the author has constructed a framework for the successful implementation of PSPs of lean in Malaysian automotive as in Figure 4.23. The framework, at a glance, shows which success factors are critical for which elements of PSPs of problem solving in lean for Malaysian automotive, and also it gives idea which elements have need more factors to be addressed for successful implementation.

Factor 25 and 27 hits maximum number of elements, they hit total seven elements; and F8, F14 and F22 also have greater number of elements in touch, the number of element they influence is five. As these factors influence more elements, they could have priority to address while establishing PSPs of lean. Alternative strategy could be: firstly, address the factors that influence the PSPs of lean in overall implementation and then go for other factors as per priority. But in both cases, we need to give first priority to F29 (motivation) as it has effect on all elements except data verification, standardizing the procedure of problem solving and categorizing the problems.

Every employee is going to the source to collect reliable data and ensuring visibility of any problems occurred in his/her area depends highly on the organization culture (F8). Encouraging each other for continuous improvement and following the best practices everywhere are also the two major parts of this culture. Employees value a good organization culture while deciding to change the company and thus culture helps to protect knowledge of experts of a company from being drained to other companies.

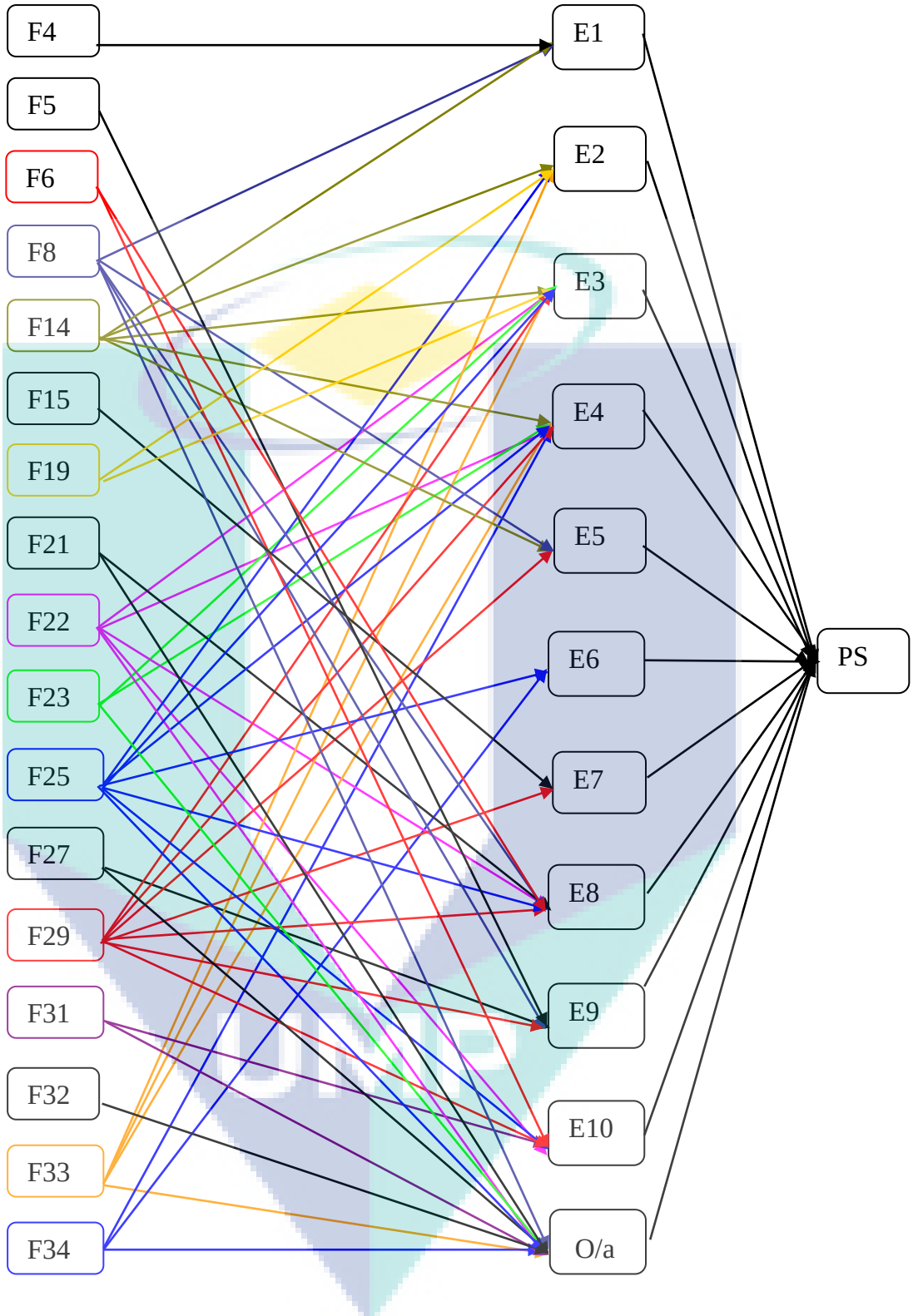

Figure 4.23 Framework for CSFs for PSPs of Lean in Malaysian Automotive

(Note: PS – Problem Solving; O/a – Overall application)

From making the problems visible and getting data, to analyse cause and solutions, to finally, implementing fast; in all these steps process owners (F14) play a vital role. Their contribution in standardizing the problem solving process itself is also significant. This supports the bottom up approach of managing any organization as highly beneficial. On the other hand, top management's leadership is important to encourage employees to improve continuously and retain them in the company. A bottom up approach powered by a conduction of day by day tasks and activities run by process owners, and their direct and proactive involvement in improvement projects is the key to problem solving in lean.

It takes less time, when employees work together to find and analyze causes of problems, and bring their ideas for solutions. To implement best practice and specially, to strengthen the process, group thinking and efforts are obvious. In lean PS, they are expected to encourage each other. Hence team spirit (F22) controls the performance of implementation of principles in workplace. To support all activities and planning of actions, Metrics (F25) for performance measurement shows the lacking of current methods and the strength of alternatives; thus helps to improve and standardize the process and procedure. Also accountability (F25) is the key to held people responsible for their responsibilities.

The result which is very interesting is that among the factors found just below the average r+c value in overall DEMATEL analysis to exclude from the list of critical factors; factor F4 (Human resource empowerment), F5 (Compelling need to change), F15 (New knowledge and mindset) are found critical for single element separately and F19 (Understand the process) has appeared as critical for 2 elements; and the most interesting result is F26 (Keep track of progress) did not appear to be critical for any element at any level of achievements when only continuous learning and improvement is focused in lean.

4.7 Chapter Summary

In this chapter, by applying focus group technique, firstly, the researcher has classified SFs as highly relevant to elements of PSPs of lean and then as critical for overall implementation using DEMATEL. In the later stage,

comparing those factors pair wise in groups for different elements resulted in finding CSFs for implementing those principles separately. Finally, the CSFs are merged and along with the interpretation and discussions, a framework for PSPs of lean is developed.

CHAPTER 5

CONCLUSION

5.1 Introduction

This chapter summarizes the way followed to achieve the results, and how the results contribute to the knowledge and practice. Limitations and recommendations are also presented at the end.

5.2 Summary of Results with Interpretation

While studying the causes of lean failure in extant literatures, the researcher found that the problem lies in the lack of work on principles. Then going into deeper details revealed many SFs for the implementation are overlooked or inadequately researched. In this thesis, the factors are firstly classified for principles of problem solving at the element level applying Focus Group (Research Objective no. 1) and then, the pair-wise importance and influence of each SF on another are analysed using DEMATEL as a whole (Research Objective no. 2) and in groups of SFs for any element (research objective no. 3) as per views of lean experts from a representative automotive industry in Malaysia. The outcomes of the study suggested the areas of competitive leverages with ranking (Research Objective no. 2) and a set of 17 CSFs for PSPs of lean to guarantee a successful implementation (Research Objective no. 3). Finally, a framework of CSFs and elements of PSPs (Research Objective no. 4) is constructed.

In this age of high competitions, always there is a need for change which helps to get people on board striving for improvement. But the people need to understand the process and be capable of applying all principles and tools required for successful implementation. The company must have detail plan for all activities and employees including the suppliers (Lande et al., 2016). Everyone should be quality conscious and quality should be managed appropriately. Hence training for all should be mandatory in order to create awareness and interest (Singh & Singh, 2016). It is fundamental to ensure that workers know the tools and the problem-solving methodology to autonomously run daily problem solving activities and rapidly transfer the knowledge.

Continuous improvement and learning must be inspired by top management who instill it in other members of the organization. Management must motivate process owners and create the best conditions for the diffusion of LPs and empower individuals with the maximum number of tasks and responsibility transferred to shop floor workers, in order to create the need for employees to be strongly encouraged to think actively and proactively. Delegating the power of choosing and autonomy can improve the quality and the quantity of knowledge transferred, increase people's willingness to be involved, and favor the adaptation of new lean knowledge to plant's strategic goals, objectives, problems, and priorities.

All the initiatives mentioned are useless if they are not accompanied by an effective communication aimed at conveying the vision of change to employees and aligning their goals with the ones embedded in the change. Communication is a fundamental mean of the lean transformation. It has also a strong motivational impact on employees when it is used to share best practices and positive outcomes related to lean initiatives. Communication must be both verbal through the communication on best practices and the sharing of good results, but also visual at the workplace. A performance measurement system should be used to assess whether the implementation is compliant with the plan and to monitor the evolution of performances, and held teams accountable accordingly.

Organizational Culture is extremely important for successful implementation (Alefari et al., 2017). Working in small groups as team with long term focus is highly advantageous. Also progressive strategy of involving various stake holders in decision making is extremely important to implement PSPs of lean.

5.3 Implications of the Study

5.3.1 Theoretical Implications

The principles of lean have not been studied enough, let alone standardizing the elements of problem solving principles of lean. Most of the research, so far, has resulted in few factors for overall lean implementation whereas this research, to the best of the researcher's knowledge, is among the first studies which simultaneously investigated the PSPs of lean and standardized with distinct elements, and based on experts' judgments the CSFs for the implementation of each and every elements are studied separately. Thus this study has added new dimensions in the literature of operation management. This study revealed that only principles under the category of problem solving have 17 critical factors to implement effectively and efficiently. The other categories of philosophy, 'people and partners' and process in lean have more number of principles and subsequently, a good number of elements; hence this research directs to analyze all principles of lean at the element level to find standard set of critical factors.

This research was intended to create a new approach to enhance success rate of lean implementation. In place of considering the overall impact of SFs on implementation of lean as available in contemporary literatures, going into deeper details of principles and even their elements, this study has rendered more reliability and confidence to implement lean. Because some factors may not be in the higher rank in overall implementation but for a specific element of a specific principle they can be highly influential (Islam et al., 2019; Islam & Mustafa, 2019). Segregating SFs as per elements of principles of a management system and compiling them as per criticality found at the element level, is an added methodology to the existing knowledge. In fact, using the same approach and methodology we can find and address all the CSFs for all elements of all principles to implement and sustain any advanced management system like lean.

Again in methodology, combination of α value as calculated and as decided for impact relation diagram, and separately presenting four quadrants impact relation map using mean r+c value (Chuang et al., 2013; Chien et al., 2014; Hwang et al., 2016) has shown the way of avoiding complexity and analyzing clearly.

5.3.2 Practical Implications

Solving problem, a universal day to day agenda, is an integral part of management's responsibility in any organization. To implement PSPs, a company sets its strategic plan and roadmap based on the current status where priorities depend on the knowledge about the critical areas. Otherwise going back and forth creates chaos, and kills the momentum of the implementation initiatives. To clear the confusions and to avoid struggles from the initial stage of implementing any element of a new principle, the detail preparation for all CSFs is required to prevent the premature death of implementation journey. Moreover, knowing the CSFs a company can also prioritize areas producing the greatest competitive leverages.

If the PSPs of lean are implemented and sustained, the experiences gained through problem solving would be the great source and way for continuous improvement and learning for the individuals involved in the problem solving process and the others who take the outcomes as future reference. In fact, any problem is an opportunity to improve process and develop people continuously (Coetzee et al., 2016). Also, it is through the process of problem solving that true respect is shown by acknowledging the invaluable inputs that workers can give. PSPs of lean like structuring problem solving procedure and strengthening the problem solving process are required to ensure these benefits.

Again, in this age of incredibly increasing competition, every company is striving for faster production and quicker delivery to remain competent in the market. If the problems in the value stream are not solved quickly, to follow the principle of "stop and fix" from Toyota Way would be quite tough. Due to frequent stops of all connected processes and additional cascading effects; the loss will be tremendous. So the demand of uninterrupted or continuous flow is very high in lean. Implementing PSPs of lean by emphasizing on the care of all CSFs may create a favorable environment for better and faster solutions.

This research shows the criticality of the factors differs from one element to another. As all elements of principles need to establish to get benefits of any management system, industrial practitioners need to take care of specific critical factors for an element. This research helps to identify specific factors for each element of PSPs

of lean. Also, based on their interrelationships and ranking, researchers can set the priority to address them during implementation. Instead of addressing all elements together, if there is requirement to focus on one or more specific element(s) of principles arises in any organization, the study helps to address the specific factors critical for that or those elements only. Hence the flexibility of implementation is an added benefit of this research. Even the problems to implement other principles of lean can be solved more efficiently once the organization has already implemented the PSPs of lean successfully. By standardizing the elements of PSPs, this research shows the way of and encourages viewing the lean implementation process in greater detail in the pursuit of perfection.

This case study was conducted in a big and mature automotive industry in Malaysia where a good number of subject matter experts contributed to find the results. Hence the research will help Malaysian auto industries to implement PSPs of lean successfully and gain more benefits out of it. Again, though the study is intended to find CSFs for the implementation of PSPs of lean in Malaysian automotive industry, any organization in context of any country may use the results of this research to have an idea of the implementation strategy for PSPs of lean.

5.4 Limitations and Suggestions for Future Studies

In this research, all the elements of PSPs of lean were considered as equally important. With comparative weights for different elements, the study may bring more accurate results. Again, combination of Fuzzy logic and DEMATEL method in a decision making model can be applied to assess causal relations of SFs to minimize the imprecise and subjective nature of human judgments. Instead of using real numbers, in fuzzy set theory, interval sets may give improved understanding of criticality of the factors. Hence the researcher has recommended advancing this research with weights for elements, and fuzzy sets for SFs.

Some more interesting issues also remain open for future research. Firstly, the researcher has been able to get in contact with local experts in one Malaysian automotive company only, due to the ease of reaching them. Hence, it would be interesting to expand the analysis of DEMATEL to the local Lean experts from other Malaysian automobile companies, and to other foreign lean experts working in different

industries and/or operating in different countries, in order to remove influences of cultures and make the result of the analysis generic. Finally, as the focus has been placed on very specific profiles with managerial roles. Yet, since they pointed that shop floor workers are at the very heart of lean problem solving and their deep engagement is highly required, so it could be interesting for future researcher in this field also to investigate shop floor workers' opinions. Indeed, in this way it could be possible to understand what the real means are, by which employees feel motivated to participate in problem solving and thus, ultimately understanding what are the factors that incentivize their engagement in accordance with their point of view.

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APPENDIX A

COVER LETTER TO MODERATOR

Dear Sir,

Report indicates that Malaysian automotives are not competitive and losing the battle to compete with developed nations in global markets, mainly as organisations struggle with best practice implementation. It could thus be argued that Malaysian automotives are on a burning platform, requiring immediate and focused action.

Lean is widely considered to be the solution immediately available that can produce the results on the scale required, especially as lean thinking has proofed to boost productivity while reducing defects, inventories, on-the-job accidents, space requirements, time-to-market for new products, the cost of extra product variability, and costs in general. It thus appears that lean has become an inevitability, which, if correctly executed, can produce impressive results. However, even amongst the pioneers and advocates of lean, there is doubt as to the reasons why lean implementations mostly fail or do not achieve the same results as is the case at Toyota, and as such what are the critical success factors for the successful implementation of problem solving principles of lean. The primary objective of this master study, conducted under the auspices of the Faculty of Industrial Management at the University Malaysia PAHANG, is to identify the factors or variables that influence and eventually determine the successful implementation problem solving principles of lean as a business management strategy in Malaysian automotive.

Thank you for your time to participate. Your valued contribution will provide Malaysian automotive with how to implement lean more successfully.

APPENDIX B

GRADE SUCCESS FACTORS

Complete the table of "Grade Success Factors" for elements of PSPs of lean by putting '0' for 'no relevance', '1' for 'low relevance', '2' for 'medium relevance', '3' for 'high relevance' and '4' for 'very high relevance' in the cell where both the row of the factor and the column of the element intersects. To select the success factors for elements of PSPs of lean, the respondents will be provided the Table B1 given below:

Table B1 Grade Success Factors

Success factors	Use reliable data	Standardize problem solving procedure	Root causes & alternative solutions	Implement quickly	Make problems visible	Approach problems categorically	Reflect mistakes & standardize processes	Encourage Continuous improvement	Best practices & strengthening	Knowledge protection
Vision and business plan										
Manageable goals										
Organizational structure										
Human resource empowerment										
Compelling need to change										
Leadership from top management										
Financial capabilities										
Organizational culture										
Total commitment to theories & tools										
Resistance to change										
Resources allocation										
Timing for change										
Project management										
Engagement of Process Owners										
Knowledge and Mindset										

Table B1 Continued

Success factors	Use reliable data	Standardize problem solving procedure	Root causes & alternative solutions	Implement quickly	Make problems visible	Approach problems categorically	Reflect mistakes & standardize processes	Encourage Continuous improvement	Best practices & strengthening	Knowledge protection
Skills and expertise										
Utilize Technology										
Attitudes and behaviors										
Understand the process										
Create internal consultant										
Effective communication										
Teamwork										
Right kind of training										
Downtime management										
Metrics and accountability										
Keep track of progress										
Extend beyond production & to suppliers										
Manage reactions										
Motivation										
Suppliers performance										
Business strategy										
Detailed Implementation plan										
Apply the full set of lean principles and tools										
Quality awareness and management										
Inventory control										
Organizational infrastructure										

APPENDIX C

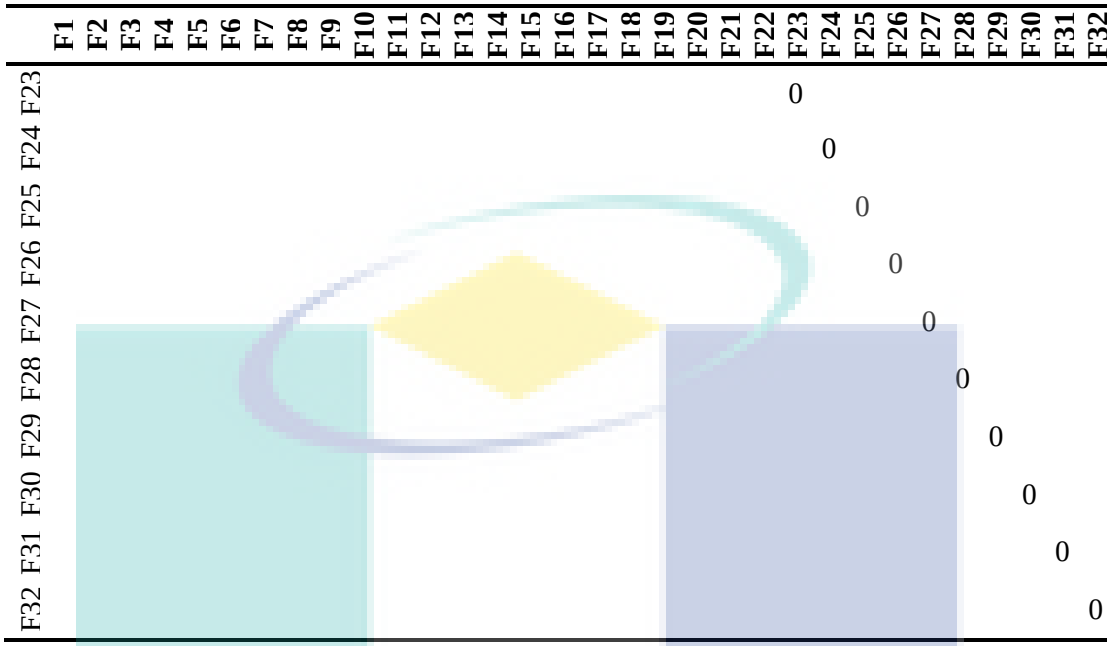
PAIR WISE COMPARISON TEMPLATE

Table C1 is for pair wise comparison of graded success factors by putting 0 for 'No influence', 1 for 'Low influence', 2 for 'Medium influence', 3 for 'High influence' and 4 for "Very high influence':

Table C1 Pair wise comparison template

	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12	F13	F14	F15	F16	F17	F18	F19	F20	F21	F22	F23	F24	F25	F26	F27	F28	F29	F30	F31	F32
F1	0																															
F2		0																														
F3			0																													
F4				0																												
F5					0																											
F6						0																										
F7							0																									
F8								0																								
F9									0																							
F10										0																						
F11											0																					
F12												0																				
F13													0																			
F14														0																		
F15															0																	
F16																0																
F17																	0															
F18																		0														
F19																			0													
F20																				0												
F21																					0											
F22																						0										

Table C1 Continued



APPENDIX D

APPROVAL LETTER FOR DATA COLLECTION

The application letter from the faculty of the researcher which was approved by the industry applied for data collection is given in Figure D1.

Universiti Malaysia PAHANG | Fakulti Pengurusan Industri

Ref. No. : UMP.27.02/13.16/6/3 Jld. 18 ( )
Date : 8th November 2018

DRB-HICOM PEKAN AUTOMOTIVE COMPLEX
PERAMU JAYA INDUSTRIAL AREA
P.O BOX 7, 26607 PEKAN,
PAHANG DARUL MAKMUR

Dear Sir,

APPLICATION TO OBTAIN DATA COLLECTION FOR RESEARCH PURPOSES

NAME	:	**ASM TOUHIDUL ISLAM**
MATRIK NO	:	**MPO18001**
PROGRAMME	:	**MASTER OF SCIENCE**
SUPERVISOR	:	**ASSOC. PROF. DR. SHAHRYAR SOROOSHIAN**

2. Please be informed that the above mentioned name is Master of Science student of Universiti Malaysia Pahang (UMP), Kuantan, Pahang.

3. We appreciate if you can support and give cooperation to respond to the survey and other related research activities. We assure you that the response will be kept confidential and results to be used for research purposes only.

4. All your assistance is highly appreciated.

"BERKHIDMAT UNTUK NEGARA"
Memasyarakatkan Teknologi

Your Sincerely,

(DR. YUDI FERNANDO)
Deputy Dean (Research & Postgraduate)
Faculty of Industrial Management
Universiti Malaysia Pahang

Tel : 09-549 2455
Fax : 09-549 2167
Email : yudi@ump.edu.my

HICOM AUTOMOTIVE MANUFACTURERS (MALAYSIA) SDN. BHD.
(Company No. 106884-D)
Kompleks Automotif DRB-HICOM Pekan,
Kawasan Perindustrian Peramu Jaya,
Kotak Berkunci 7, 26607 Pekan, Pahang Darul Makmur
Tel: +609-424 4000 Fax: +609-424 4023

* Roles to support in term of comments to norms. research materials focusing on Problem solving principles.

www.ump.edu.my

Figure D1 Application Approval Letter For Data Collection

APPENDIX E

SUCCESS FACTORS' SCORE FOR ELEMENTS

Data given by 16 respondents (Rs) for the degree of relevance of SFs with elements of PSPs of lean has been given presented in below Table E1 with standard deviation (SD) and square of standard deviation calculation:

Table E1 Success factors' relevance score analysis

	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	R16	SD	Square of SD
F1E1	0	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0.47	0.22
F1E2	2	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	0.50	0.25
F1E3	3	3	4	4	4	4	4	4	4	4	3	3	3	3	3	3	0.51	0.26
F1E4	2	3	4	4	4	4	4	4	4	4	2	2	2	2	2	2	0.97	0.95
F1E5	2	1	3	3	3	3	3	3	3	3	2	2	2	2	2	2	0.65	0.42
F1E6	3	3	4	4	4	4	4	4	4	4	3	3	3	3	3	3	0.51	0.26
F1E7	1	4	2	2	2	2	2	2	2	2	1	1	1	1	1	1	0.80	0.64
F1E8	3	3	4	4	4	4	4	4	4	4	3	3	3	3	3	3	0.51	0.26
F1E9	2	3	4	4	4	4	4	4	4	4	2	2	2	2	2	2	0.97	0.95
F1E10	3	3	4	4	4	4	4	4	4	4	3	3	3	3	3	3	0.51	0.26
F2E1	0	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0.47	0.22
F2E2	1	4	2	2	2	2	2	2	2	2	1	1	1	1	1	1	0.80	0.64
F2E3	1	4	3	3	3	3	3	3	3	3	1	1	1	1	1	1	1.08	1.17
F2E4	2	4	3	3	3	3	3	3	3	3	2	2	2	2	2	2	0.61	0.37
F2E5	0	3	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0.80	0.64
F2E6	2	2	3	3	3	3	3	3	3	3	2	2	2	2	2	2	0.51	0.26
F2E7	1	3	2	2	2	2	2	2	2	2	1	1	1	1	1	1	0.61	0.37
F2E8	3	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	0.50	0.25
F2E9	1	4	2	2	2	2	2	2	2	2	1	1	1	1	1	1	0.80	0.64
F2E10	2	1	4	4	4	4	4	4	4	4	2	2	2	2	2	2	1.14	1.30
F3E1	3	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	0.47	0.22
F3E2	3	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	0.50	0.25
F3E3	1	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	0.50	0.25
F3E4	2	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	0.50	0.25
F3E5	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0.50	0.25
F3E6	0	2	2	2	2	2	2	2	2	2	0	0	0	0	0	0	0.99	0.99
F3E7	1	3	3	3	3	3	3	3	3	3	1	1	1	1	1	1	0.99	0.99
F3E8	2	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	0.50	0.25

Table E1 Continued

	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	R16	SD	Square of SD
F3E9	2	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	0.50	0.25
F3E10	3	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	0.50	0.25
F8E1	3	4	4	4	4	4	4	4	4	4	4	3	3	3	3	3	0.47	0.22
F8E2	2	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	0.50	0.25
F8E3	2	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	0.50	0.25
F8E4	2	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	0.50	0.25
F8E5	3	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	0.50	0.25
F8E6	2	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	0.50	0.25
F8E7	3	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	0.50	0.25
F8E8	3	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	0.50	0.25
F8E9	2	4	4	4	4	4	4	4	4	4	2	2	2	2	2	2	0.99	0.99
F8E10	3	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	0.50	0.25
F9E1	1	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	0.47	0.22
F9E2	2	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	0.50	0.25
F9E3	3	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	0.50	0.25
F9E4	3	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	0.50	0.25
F9E5	1	3	3	3	3	3	3	3	3	3	1	1	1	1	1	1	0.99	0.99
F9E6	1	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	0.50	0.25
F9E7	1	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	0.50	0.25
F9E8	3	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	0.50	0.25
F9E9	2	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	0.50	0.25
F9E10	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0.50	0.25
F10E1	1	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	0.47	0.22
F10E2	2	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	0.50	0.25
F10E3	3	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	0.50	0.25
F10E4	3	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	0.50	0.25
F10E5	3	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	0.50	0.25
F10E6	1	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	0.50	0.25
F10E7	3	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	0.50	0.25
F10E8	3	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	0.50	0.25
F10E9	3	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	0.50	0.25
F10E10	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0.50	0.25
F11E1	1	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	0.47	0.22
F11E2	3	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	0.50	0.25
F11E3	1	3	3	3	3	3	3	3	3	3	1	1	1	1	1	1	0.99	0.99
F11E4	3	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	0.50	0.25
F11E5	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0.50	0.25

Table E1 Continued

	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	R16	SD	Square of SD
F11E6	3	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	0.50	0.25
F11E7	1	3	3	3	3	3	3	3	3	3	1	1	1	1	1	1	0.99	0.99
F11E8	2	4	4	4	4	4	4	4	4	4	2	2	2	2	2	2	0.99	0.99
F11E9	3	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	0.50	0.25
F11E10	3	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	0.50	0.25
F12E1	0	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0.47	0.22
F12E2	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0.50	0.25
F12E3	2	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	0.50	0.25
F12E4	3	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	0.50	0.25
F12E5	1	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	0.50	0.25
F12E6	1	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	0.50	0.25
F12E7	1	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	0.50	0.25
F12E8	2	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	0.50	0.25
F12E9	2	4	4	4	4	4	4	4	4	4	2	2	2	2	2	2	0.99	0.99
F12E10	1	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	0.50	0.25
F13E1	0	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0.47	0.22
F13E2	1	3	3	3	3	3	3	3	3	3	1	1	1	1	1	1	0.99	0.99
F13E3	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0.50	0.25
F13E4	3	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	0.50	0.25
F13E5	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0.50	0.25
F13E6	1	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	0.50	0.25
F13E7	1	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	0.50	0.25
F13E8	1	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	0.50	0.25
F13E9	1	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	0.50	0.25
F13E10	1	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	0.50	0.25
F14E1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	0.00	0.00
F14E2	3	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	0.50	0.25
F14E3	3	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	0.50	0.25
F14E4	3	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	0.50	0.25
F14E5	3	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	0.50	0.25
F14E6	2	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	0.50	0.25
F14E7	1	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	0.50	0.25
F14E8	3	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	0.50	0.25
F14E9	2	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	0.50	0.25
F14E10	1	3	3	3	3	3	3	3	3	3	1	1	1	1	1	1	0.99	0.99
F15E1	1	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	0.47	0.22

Table E1 Continued

	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	R16	SD	Square of SD
F15E2	2	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	0.50	0.25
F15E3	2	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	0.50	0.25
F15E4	3	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	0.50	0.25
F15E5	1	3	3	3	3	3	3	3	3	3	1	1	1	1	1	1	0.99	0.99
F15E6	2	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	0.50	0.25
F15E7	3	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	0.50	0.25
F15E8	3	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	0.50	0.25
F15E9	1	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	0.50	0.25
F15E10	2	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	0.50	0.25
F16E1	1	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	0.47	0.22
F16E2	3	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	0.50	0.25
F16E3	3	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	0.50	0.25
F16E4	2	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	0.50	0.25
F16E5	0	2	2	2	2	2	2	2	2	2	0	0	0	0	0	0	0.99	0.99
F16E6	1	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	0.50	0.25
F16E7	1	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	0.50	0.25
F16E8	2	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	0.50	0.25
F16E9	1	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	0.50	0.25
F16E10	1	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	0.50	0.25
F17E1	1	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	0.47	0.22
F17E2	1	3	3	3	3	3	3	3	3	3	1	1	1	1	1	1	0.99	0.99
F17E3	1	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	0.50	0.25
F17E4	1	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	0.50	0.25
F17E5	0	2	2	2	2	2	2	2	2	2	0	0	0	0	0	0	0.99	0.99
F17E6	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0.50	0.25
F17E7	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0.50	0.25
F17E8	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0.50	0.25
F17E9	1	3	3	3	3	3	3	3	3	3	1	1	1	1	1	1	0.99	0.99
F17E10	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0.50	0.25
F18E1	2	3	3	3	3	3	3	3	3	3	3	2	2	2	2	2	0.47	0.22
F18E2	2	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	0.50	0.25
F18E3	3	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	0.50	0.25
F18E4	1	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	0.50	0.25
F18E5	2	4	4	4	4	4	4	4	4	4	2	2	2	2	2	2	0.99	0.99
F18E6	1	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	0.50	0.25
F18E7	1	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	0.50	0.25

Table E1 Continued

	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	R16	SD	Square of SD
F18E8	3	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	0.50	0.25
F18E9	2	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	0.50	0.25
F18E10	1	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	0.65	0.42
F19E1	3	4	4	4	4	4	4	4	4	4	4	3	3	3	3	3	0.47	0.22
F19E2	3	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	0.50	0.25
F19E3	3	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	0.50	0.25
F19E4	3	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	0.50	0.25
F19E5	1	3	3	3	3	3	3	3	3	3	1	1	1	1	1	1	0.99	0.99
F19E6	3	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	0.50	0.25
F19E7	2	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	0.50	0.25
F19E8	2	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	0.50	0.25
F19E9	2	4	4	4	4	4	4	4	4	4	2	2	2	2	2	2	0.99	0.99
F19E10	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0.50	0.25
F20E1	0	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0.47	0.22
F20E2	2	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	0.50	0.25
F20E3	2	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	0.50	0.25
F20E4	3	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	0.50	0.25
F20E5	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0.50	0.25
F20E6	2	4	4	4	4	4	4	4	4	4	2	2	2	2	2	2	0.99	0.99
F20E7	1	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	0.50	0.25
F20E8	2	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	0.50	0.25
F20E9	2	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	0.50	0.25
F20E10	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0.50	0.25
F21E1	3	4	4	4	4	4	4	4	4	4	4	3	3	3	3	3	0.47	0.22
F21E2	3	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	0.50	0.25
F21E3	3	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	0.50	0.25
F21E4	2	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	0.50	0.25
F21E5	2	4	4	4	4	4	4	4	4	4	2	2	2	2	2	2	0.99	0.99
F21E6	1	3	3	3	3	3	3	3	3	3	1	1	1	1	1	1	0.99	0.99
F21E7	1	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	0.50	0.25
F21E8	3	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	0.50	0.25
F21E9	1	3	3	3	3	3	3	3	3	3	1	1	1	1	1	1	0.99	0.99
F21E10	1	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	0.50	0.25
F22E1	2	3	3	3	3	3	3	3	3	3	3	2	2	2	2	2	0.47	0.22
F22E2	3	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	0.50	0.25
F22E3	2	4	4	4	4	4	4	4	4	4	2	2	2	2	2	2	0.99	0.99

Table E1 Continued

	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	R16	SD	Square of SD
F22E4	3	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	0.50	0.25
F22E5	1	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	0.50	0.25
F22E6	1	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	0.50	0.25
F22E7	2	4	4	4	4	4	4	4	4	4	2	2	2	2	2	2	0.99	0.99
F22E8	3	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	0.50	0.25
F22E9	2	4	4	4	4	4	4	4	4	4	2	2	2	2	2	2	0.99	0.99
F22E10	2	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	0.50	0.25
F23E1	1	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	0.47	0.22
F23E2	2	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	0.50	0.25
F23E3	3	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	0.50	0.25
F23E4	3	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	0.50	0.25
F23E5	1	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	0.50	0.25
F23E6	2	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	0.50	0.25
F23E7	2	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	0.50	0.25
F23E8	2	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	0.50	0.25
F23E9	2	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	0.50	0.25
F23E10	0	2	2	2	2	2	2	2	2	2	0	0	0	0	0	0	0.99	0.99
F24E1	0	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0.47	0.22
F24E2	2	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	0.50	0.25
F24E3	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0.50	0.25
F24E4	3	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	0.50	0.25
F24E5	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0.50	0.25
F24E6	1	3	3	3	3	3	3	3	3	3	1	1	1	1	1	1	0.99	0.99
F24E7	2	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	0.50	0.25
F24E8	2	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	0.50	0.25
F24E9	2	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	0.50	0.25
F24E10	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0.50	0.25
F25E1	2	3	3	3	3	3	3	3	3	3	3	2	2	2	2	2	0.47	0.22
F25E2	3	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	0.50	0.25
F25E3	3	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	0.50	0.25
F25E4	2	4	4	4	4	4	4	4	4	4	2	2	2	2	2	2	0.99	0.99
F25E5	2	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	0.50	0.25
F25E6	3	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	0.50	0.25
F25E7	1	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	0.50	0.25
F25E8	3	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	0.50	0.25
F25E9	2	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	0.50	0.25
F25E10	2	4	4	4	4	4	4	4	4	4	2	2	2	2	2	2	0.99	0.99

Table E1 Continued

	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	R16	SD	Square of SD
F26E1	2	3	3	3	3	3	3	3	3	3	3	2	2	2	2	2	0.47	0.22
F26E2	2	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	0.50	0.25
F26E3	1	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	0.50	0.25
F26E4	2	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	0.50	0.25
F26E5	1	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	0.50	0.25
F26E6	2	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	0.50	0.25
F26E7	1	3	3	3	3	3	3	3	3	3	1	1	1	1	1	1	0.99	0.99
F26E8	3	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	0.50	0.25
F26E9	3	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	0.50	0.25
F26E10	2	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	0.50	0.25
F27E1	2	3	3	3	3	3	3	3	3	3	3	2	2	2	2	2	0.47	0.22
F27E2	2	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	0.50	0.25
F27E3	2	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	0.50	0.25
F27E4	2	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	0.50	0.25
F27E5	1	3	3	3	3	3	3	3	3	3	1	1	1	1	1	1	0.99	0.99
F27E6	2	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	0.50	0.25
F27E7	2	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	0.50	0.25
F27E8	2	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	0.50	0.25
F27E9	3	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	0.50	0.25
F27E10	2	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	0.50	0.25
F28E1	1	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	0.47	0.22
F28E2	3	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	0.50	0.25
F28E3	3	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	0.50	0.25
F28E4	3	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	0.50	0.25
F28E5	2	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	0.50	0.25
F28E6	2	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	0.50	0.25
F28E7	2	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	0.50	0.25
F28E8	3	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	0.50	0.25
F28E9	1	3	3	3	3	3	3	3	3	3	1	1	1	1	1	1	0.99	0.99
F28E10	2	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	0.50	0.25
F29E1	2	3	3	3	3	3	3	3	3	3	3	2	2	2	2	2	0.47	0.22
F29E2	3	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	0.50	0.25
F29E3	3	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	0.50	0.25
F29E4	3	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	0.50	0.25
F29E5	3	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	0.50	0.25
F29E6	1	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	0.50	0.25

Table E1 Continued

	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	R16	SD	Square of SD
F29E7	2	4	4	4	4	4	4	4	4	4	2	2	2	2	2	2	0.99	0.99
F29E8	3	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	0.50	0.25
F29E9	3	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	0.50	0.25
F29E10	3	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	0.50	0.25
F30E1	0	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0.47	0.22
F30E2	1	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	0.50	0.25
F30E3	1	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	0.50	0.25
F30E4	2	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	0.50	0.25
F30E5	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0.50	0.25
F30E6	0	2	2	2	2	2	2	2	2	2	0	0	0	0	0	0	0.99	0.99
F30E7	1	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	0.50	0.25
F30E8	3	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	0.50	0.25
F30E9	1	3	3	3	3	3	3	3	3	3	1	1	1	1	1	1	0.99	0.99
F30E10	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0.50	0.25
F31E1	0	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0.47	0.22
F31E2	1	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	0.50	0.25
F31E3	1	3	3	3	3	3	3	3	3	3	1	1	1	1	1	1	0.99	0.99
F31E4	1	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	0.50	0.25
F31E5	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0.50	0.25
F31E6	2	4	4	4	4	4	4	4	4	4	2	2	2	2	2	2	0.99	0.99
F31E7	0	2	2	2	2	2	2	2	2	2	0	0	0	0	0	0	0.99	0.99
F31E8	2	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	0.50	0.25
F31E9	2	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	0.50	0.25
F31E10	3	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	0.50	0.25
F32E1	0	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0.47	0.22
F32E2	2	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	0.50	0.25
F32E3	2	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	0.50	0.25
F32E4	2	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	0.50	0.25
F32E5	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0.50	0.25
F32E6	2	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	0.50	0.25
F32E7	3	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	0.50	0.25
F32E8	2	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	0.50	0.25
F32E9	2	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	0.50	0.25
F32E10	2	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	0.50	0.25
F33E1	0	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0.47	0.22
F33E2	2	4	4	4	4	4	4	4	4	4	2	2	2	2	2	2	0.99	0.99

Table E1 Continued

	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	R16	SD	Square of SD
F33E3	3	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	0.50	0.25
F33E4	3	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	0.50	0.25
F33E5	2	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	0.50	0.25
F33E6	1	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	0.50	0.25
F33E7	2	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	0.50	0.25
F33E8	3	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	0.50	0.25
F33E9	3	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	0.50	0.25
F33E10	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0.50	0.25
F34E1	1	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	0.47	0.22
F34E2	2	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	0.50	0.25
F34E3	3	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	0.50	0.25
F34E4	3	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	0.50	0.25
F34E5	3	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	0.50	0.25
F34E6	2	4	4	4	4	4	4	4	4	4	2	2	2	2	2	2	0.99	0.99
F34E7	2	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	0.50	0.25
F34E8	2	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	0.50	0.25
F34E9	3	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	0.50	0.25
F34E10	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0.50	0.25
F35E1	0	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0.47	0.22
F35E2	1	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	0.50	0.25
F35E3	2	4	4	4	4	4	4	4	4	4	2	2	2	2	2	2	0.99	0.99
F35E4	2	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	0.50	0.25
F35E5	2	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	0.50	0.25
F35E6	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0.50	0.25
F35E7	2	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	0.50	0.25
F35E8	3	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	0.50	0.25
F35E9	2	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	0.50	0.25
F35E10	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0.50	0.25
F36E1	1	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	0.47	0.22
F36E2	1	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	0.50	0.25
F36E3	1	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	0.50	0.25
F36E4	2	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	0.50	0.25
F36E5	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0.50	0.25
F36E6	1	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	0.50	0.25
F36E7	1	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	0.50	0.25
F36E8	1	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	0.50	0.25

Table E1 Continued

	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	R16	SD	Square of SD
F36E9	1	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	0.50	0.25
F36E10	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0.50	0.25

Table E2 Element wise success factor(s)' average scores

Sl.	Success factors	E1	E2	E3	E4	E5	E6	E7	E8	E9	E10	Ave-rage
F1	Vision and business plan	0.7	2.8	3.8	3.4	2.8	3.8	1.7	3.8	3.4	3.8	2.99
F2	Manageable goals	0.7	1.7	2.3	2.8	0.6	2.8	1.7	3.8	1.7	3.4	2.14
F3	Organizational structure	2.5	3.8	1.7	2.8	0.6	1.3	2.3	2.8	2.8	3.8	2.43
F4	Human resource empowerment	3.2	3.8	3.8	2.8	3.8	1.7	3.8	3.8	2.8	3.8	3.33
F5	Compelling need to change	0.7	3.4	2.8	3.8	2.8	3.8	3.8	3.4	3.8	0.6	2.88
F6	Leadership from top management	1.8	3.8	1.3	2.8	2.8	2.8	2.8	3.8	3.8	3.8	2.93
F7	Financial capabilities	0.7	2.8	0.6	2.8	0.6	2.3	0.6	0.6	2.8	3.8	1.76
F8	Organizational culture	3.9	2.8	2.8	2.8	3.8	2.8	3.8	3.8	3.4	3.8	3.35
F9	Total commitment to theories & tools	1.8	2.8	3.8	3.8	2.3	1.7	1.7	3.8	2.8	0.6	2.50
F10	Resistance to change	1.8	2.8	3.8	3.8	3.8	1.7	3.8	3.8	3.8	0.6	2.97
F11	Resources allocation	1.8	3.8	2.3	3.8	0.6	3.8	2.3	3.4	3.8	3.8	2.94
F12	Timing for change	0.7	0.6	2.8	3.8	1.7	1.7	1.7	2.8	3.4	1.7	2.08
F13	Project management	0.7	2.3	0.6	3.8	0.6	1.7	1.7	1.7	1.7	1.7	1.65
F14	Engagement process owners	3.1	3.8	3.8	3.8	3.8	2.8	1.7	3.8	2.8	2.3	3.07
F15	New knowledge and mindset	1.8	2.8	2.8	3.8	2.3	2.8	3.8	3.8	1.7	2.8	2.82
F16	Skills and expertise	1.8	3.8	3.8	2.8	1.3	1.7	1.7	2.8	1.7	1.7	2.29
F17	Utilize Technology	1.8	2.3	1.7	1.7	1.3	0.6	0.6	0.6	2.3	0.6	1.35
F18	Attitudes and behaviours	1.8	1.5	2.2	1.3	1.6	1.4	0.9	1.7	1.3	2.2	1.58

Table E2 Continued

Sl.	Success factors	E1	E2	E3	E4	E5	E6	E7	E8	E9	E10	Ave-rage
F19	Understand the process	3.9	3.8	3.8	3.8	2.3	3.8	2.8	2.8	3.4	0.6	3.09
F20	Create internal consultant	0.4	2.0	2.0	3.9	0.3	2.3	1.4	2.0	2.0	0.3	1.66
F21	Effective communication	3.9	3.8	3.8	2.8	3.4	2.3	1.7	3.8	2.3	1.7	2.94
F22	Teamwork	2.8	3.8	3.4	3.8	1.7	1.7	3.4	3.8	3.4	2.8	3.05
F26	Keep track of progress	2.8	2.8	1.7	2.8	1.7	2.8	2.3	3.8	3.8	2.8	2.71
F27	Extend beyond production & to suppliers	3.3	2.8	2.8	2.8	2.3	2.8	2.8	2.8	3.8	2.8	2.82
F28	Manage reactions	1.8	3.8	3.8	3.8	2.8	2.8	2.8	3.8	2.3	2.8	3.03
F29	Motivation	2.8	3.8	3.8	3.8	3.8	1.7	3.4	3.8	3.8	3.8	3.46
F30	Suppliers performance	0.7	1.7	1.7	2.8	0.6	1.3	1.7	2.9	2.3	0.6	1.63
F31	Business strategy	0.7	1.7	2.3	1.7	0.6	3.4	1.3	2.8	2.8	3.8	2.09
F32	Detailed Implementation plan	0.7	2.8	2.8	2.8	0.6	2.8	3.8	2.8	2.8	2.8	2.44
F33	Apply the full set of LPs and tools	0.7	3.4	3.8	3.8	2.8	1.7	2.8	3.8	3.8	0.6	2.71
F34	Quality awareness and management	1.8	2.8	3.8	3.8	3.8	3.4	2.8	2.8	3.8	0.6	2.93
F35	Inventory control	0.7	1.7	3.4	2.8	2.8	0.6	2.8	3.8	2.8	0.6	2.18
F36	Organizational infrastructure	1.8	1.7	1.7	2.8	0.6	1.7	1.7	1.7	1.7	0.6	1.59

Table E3 Element wise selected success factors' with higher score identified

Sl.	Success factors	E1	E2	E3	E4	E5	E6	E7	E8	E9	E10
F1	Vision and business plan	0.7	2.8	**3.8**	**3.4**	2.8	**3.8**	1.7	**3.8**	**3.4**	**3.8**
F2	Manageable goals	0.7	1.7	2.3	2.8	0.6	2.8	1.7	**3.8**	1.7	**3.4**
F3	Organizational structure	2.5	**3.8**	1.7	2.8	0.6	1.3	2.3	2.8	2.8	**3.8**
F4	Human resource empowerment	**3.2**	**3.8**	**3.8**	2.8	**3.8**	1.7	**3.8**	**3.8**	2.8	**3.8**
F5	Compelling need to change	0.7	**3.4**	2.8	**3.8**	2.8	**3.8**	**3.8**	**3.4**	**3.8**	0.6
F6	Leadership from top management	1.8	**3.8**	1.3	2.8	2.8	2.8	2.8	**3.8**	**3.8**	**3.8**
F7	Financial capabilities	0.7	2.8	0.6	2.8	0.6	2.3	0.6	0.6	2.8	**3.8**
F8	Organizational culture	**3.9**	2.8	2.8	2.8	**3.8**	2.8	**3.8**	**3.8**	**3.4**	**3.8**
F9	Total commitment to theories & tools	1.8	2.8	**3.8**	**3.8**	2.3	1.7	1.7	**3.8**	2.8	0.6
F10	Resistance to change	1.8	2.8	**3.8**	**3.8**	**3.8**	1.7	**3.8**	**3.8**	**3.8**	0.6
F11	Resources allocation	1.8	**3.8**	2.3	**3.8**	0.6	**3.8**	2.3	**3.4**	**3.8**	**3.8**
F12	Timing for change	0.7	0.6	2.8	**3.8**	1.7	1.7	1.7	2.8	**3.4**	1.7
F20	Create internal consultant	0.4	2.0	2.0	**3.9**	0.3	2.3	1.4	2.0	2.0	0.3
F21	Effective communication	**3.9**	**3.8**	**3.8**	2.8	**3.4**	2.3	1.7	**3.8**	2.3	1.7
F22	Teamwork	2.8	**3.8**	**3.4**	**3.8**	1.7	1.7	**3.4**	**3.8**	**3.4**	2.8
F23	Right kind of training	1.8	2.8	**3.8**	**3.8**	1.7	2.8	2.8	2.8	2.8	1.3
F24	Downtime management	0.7	2.8	0.6	**3.8**	0.6	2.3	2.8	2.8	2.8	0.6
F25	Metrics and accountability	2.8	**3.8**	**3.8**	**3.4**	2.8	**3.8**	1.7	**3.8**	2.8	**3.4**
F26	Keep track of progress	2.8	2.8	1.7	2.8	1.7	2.8	2.3	**3.8**	**3.8**	2.8
F27	Extend beyond production & to suppliers	**3.3**	2.8	2.8	2.8	2.3	2.8	2.8	2.8	**3.8**	2.8
F28	Manage reactions	1.8	**3.8**	**3.8**	**3.8**	2.8	2.8	2.8	**3.8**	2.3	2.8
F29	Motivation	2.8	**3.8**	**3.8**	**3.8**	**3.8**	1.7	**3.4**	**3.8**	**3.8**	**3.8**
F31	Business strategy	0.7	1.7	2.3	1.7	0.6	**3.4**	1.3	2.8	2.8	**3.8**
F32	Detailed Implementation plan	0.7	2.8	2.8	2.8	0.6	2.8	**3.8**	2.8	2.8	2.8
F33	Apply the full set of LPs and tools	0.7	**3.4**	**3.8**	**3.8**	2.8	1.7	2.8	**3.8**	**3.8**	0.6
F34	Quality awareness and management	1.8	2.8	**3.8**	**3.8**	**3.8**	**3.4**	2.8	2.8	**3.8**	0.6
F35	Inventory control	0.7	1.7	**3.4**	2.8	2.8	0.6	2.8	**3.8**	2.8	0.6

APPENDIX F

SUCCESS FACTORS' INTERRELATIONSHIPS

Data given by 16 respondents (Rs) for the pair wise comparison of SFs has been given presented in below Table F1 with standard deviation and square of standard deviation calculation:

Table F1 Pair wise comparison data with square of Standarad Deviation

	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	R16	Standard Deviation	Square of Standard Deviation
F1 F2	4	3	3	4	4	3	4	3	4	3	3	4	4	4	4	3	0.51	0.26
F1 F3	4	3	4	3	4	3	3	4	4	3	4	4	3	4	3	3	0.51	0.26
F1 F4	4	2	2	4	4	2	2	4	4	2	4	2	2	2	2	4	1.03	1.05
F1 F5	4	3	4	3	4	3	3	4	3	4	3	3	3	3	3	3	0.50	0.25
F1 F6	4	3	3	4	4	3	4	3	4	3	3	4	4	3	4	4	0.52	0.27
F1 F7	3	2	3	2	3	2	2	3	2	3	2	3	2	2	2	3	0.51	0.26
F1 F8	4	2	2	4	4	2	4	2	4	2	2	2	4	2	4	2	1.03	1.05
F1 F9	4	3	4	3	4	3	3	4	4	3	3	4	4	4	4	4	0.51	0.26
F1 F10	2	1	1	2	2	1	1	2	2	1	1	1	2	2	2	1	0.52	0.27
F1 F11	4	2	4	2	4	2	2	4	2	4	2	4	4	4	4	4	1.03	1.05
F1 F12	4	3	3	4	4	3	4	3	4	3	3	3	3	3	3	3	0.50	0.25
F1 F13	2	1	2	1	2	1	1	2	1	2	1	1	1	2	1	1	0.51	0.26
F1 F14	2	1	1	2	2	1	2	1	2	1	1	2	2	2	2	2	0.51	0.26
F1 F15	2	1	2	1	2	1	1	2	2	1	2	2	1	2	1	2	0.51	0.26
F1 F16	3	2	2	3	3	2	2	3	3	2	3	2	2	2	2	2	0.51	0.26
F1 F19	3	2	3	2	3	2	2	3	2	3	2	3	2	2	2	2	0.51	0.26
F1 F20	2	1	1	2	2	1	2	1	2	1	1	1	2	1	2	1	0.51	0.26
F1 F21	2	1	2	1	2	1	1	2	2	1	1	2	2	2	2	2	0.51	0.26
F1 F22	2	1	1	2	2	1	1	2	2	1	1	1	2	2	2	1	0.52	0.27
F1 F23	3	2	3	2	3	2	2	3	2	3	2	3	3	3	3	2	0.51	0.26
F1 F24	1	0	0	1	1	0	1	0	1	0	0	0	0	0	0	1	0.50	0.25
F1 F25	2	1	2	1	2	1	1	2	1	2	1	1	1	2	1	1	0.51	0.26
F1 F26	2	1	1	2	2	1	2	1	2	1	1	2	2	2	2	2	0.51	0.26
F1 F27	3	2	3	2	3	2	2	3	3	2	3	3	2	3	2	3	0.51	0.26
F1 F28	3	2	2	3	3	2	2	3	3	2	3	2	2	2	2	2	0.51	0.26
F1 F29	3	1	3	1	3	1	1	3	1	3	1	1	1	1	1	1	0.99	0.99
F1 F31	4	3	4	3	4	3	3	4	3	4	3	4	3	3	3	3	0.51	0.26
F1 F32	2	1	1	2	2	1	2	1	2	1	1	1	2	1	2	1	0.51	0.26
F1 F33	4	3	4	3	4	3	3	4	4	3	3	4	4	4	4	3	0.51	0.26
F1 F34	3	2	2	3	3	2	2	3	3	2	2	2	3	3	3	3	0.52	0.27
F1 F35	3	1	3	1	3	1	1	3	1	3	1	3	3	3	3	3	1.03	1.05
F2 F3	1	0	1	0	1	0	0	1	1	0	1	1	0	1	0	1	0.51	0.26
F2 F4	3	1	1	3	3	1	1	3	3	1	3	1	1	1	1	1	1.03	1.05
F2 F5	1	0	1	0	1	0	0	1	0	1	0	0	0	0	0	0	0.50	0.25
F2 F6	3	2	2	3	3	2	3	2	3	2	2	3	3	2	3	2	0.52	0.27

Table F1 Continued

	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	R16	Standard Deviation	Square of Standard Deviation
F2 F7	1	0	1	0	1	0	0	1	0	1	0	1	0	0	0	0	0.51	0.26
F2 F8	1	0	0	1	1	0	1	0	1	0	0	0	1	0	1	1	0.51	0.26
F2 F9	3	0	3	0	3	0	0	3	3	0	0	3	3	3	3	3	1.54	2.37
F2 F10	4	3	3	4	4	3	3	4	4	3	3	3	4	4	4	4	0.52	0.27
F2 F11	4	2	4	2	4	2	2	4	2	4	2	4	4	4	4	4	1.03	1.05
F2 F12	4	3	3	4	4	3	4	3	4	3	3	3	3	3	3	3	0.50	0.25
F2 F13	4	3	4	3	4	3	3	4	3	4	3	3	3	4	3	3	0.51	0.26
F2 F14	4	3	3	4	4	3	4	3	4	3	3	4	4	4	4	4	0.51	0.26
F2 F15	4	3	4	3	4	3	3	4	4	3	4	4	3	4	3	3	0.51	0.26
F2 F16	4	3	3	4	4	3	3	4	4	3	4	3	3	3	3	3	0.51	0.26
F2 F19	1	0	1	0	1	0	0	1	0	1	0	1	0	0	0	1	0.51	0.26
F2 F20	1	0	0	1	1	0	1	0	1	0	0	0	1	0	1	1	0.51	0.26
F2 F21	2	0	2	0	2	0	0	2	2	0	0	2	2	2	2	2	1.03	1.05
F2 F22	2	1	1	2	2	1	1	2	2	1	1	1	2	2	2	1	0.52	0.27
F2 F23	2	1	2	1	2	1	1	2	1	2	1	2	2	2	2	1	0.51	0.26
F2 F24	1	0	0	1	1	0	1	0	1	0	0	0	0	0	0	0	0.50	0.25
F2 F25	1	0	1	0	1	0	0	1	0	1	0	0	0	1	0	0	0.51	0.26
F2 F26	1	0	0	1	1	0	1	0	1	0	0	1	1	1	1	0	0.51	0.26
F2 F27	2	0	2	0	2	0	0	2	2	0	2	2	0	2	0	0	1.03	1.05
F2 F28	3	2	2	3	3	2	2	3	3	2	3	2	2	2	2	3	0.51	0.26
F2 F29	3	2	3	2	3	2	2	3	2	3	2	2	2	2	2	2	0.50	0.25
F2 F31	4	3	4	3	4	3	3	4	3	4	3	4	3	3	3	4	0.51	0.26
F2 F32	3	2	2	3	3	2	3	2	3	2	2	2	3	2	3	2	0.51	0.26
F2 F33	4	3	4	3	4	3	3	4	4	3	3	4	4	4	4	4	0.51	0.26
F2 F34	3	1	1	3	3	1	1	3	3	1	1	1	3	3	3	1	1.04	1.08
F2 F35	2	1	2	1	2	1	1	2	1	2	1	2	2	2	2	2	0.51	0.26
F3 F4	2	1	2	1	2	1	1	2	2	1	2	2	1	2	1	2	0.51	0.26
F3 F5	1	0	0	1	1	0	0	1	1	0	1	0	0	0	0	0	0.51	0.26
F3 F6	3	2	3	2	3	2	2	3	2	3	2	2	2	2	2	3	0.50	0.25
F3 F7	1	0	0	1	1	0	1	0	1	0	0	1	1	0	1	0	0.52	0.27
F3 F8	4	2	4	2	4	2	2	4	2	4	2	4	2	2	2	2	1.03	1.05
F3 F9	1	0	0	1	1	0	1	0	1	0	0	0	1	0	1	0	0.51	0.26
F3 F10	2	1	2	1	2	1	1	2	2	1	1	2	2	2	2	2	0.51	0.26
F3 F11	2	1	1	2	2	1	1	2	2	1	1	1	2	2	2	1	0.52	0.27
F3 F12	1	0	1	0	1	0	0	1	0	1	0	1	1	1	1	0	0.51	0.26
F3 F13	3	2	2	3	3	2	3	2	3	2	2	2	2	2	2	3	0.50	0.25
F3 F14	3	2	3	2	3	2	2	3	2	3	2	2	2	3	2	2	0.51	0.26
F3 F15	2	0	0	2	2	0	2	0	2	0	0	2	2	2	2	2	1.03	1.05
F3 F16	2	1	2	1	2	1	1	2	2	1	2	2	1	2	1	2	0.51	0.26
F3 F19	2	1	1	2	2	1	2	1	2	1	1	2	2	1	2	2	0.52	0.27
F3 F20	2	1	2	1	2	1	1	2	1	2	1	2	1	1	1	1	0.51	0.26

Table F1 Continued

	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	R16	Standard Deviation	Square of Standard Deviation
F3 F21	4	3	3	4	4	3	4	3	4	3	3	3	4	3	4	3	0.51	0.26
F3 F22	4	3	4	3	4	3	3	4	4	3	3	4	4	4	4	3	0.51	0.26
F3 F23	1	0	0	1	1	0	0	1	1	0	0	0	1	1	1	1	0.52	0.27
F3 F24	3	2	3	2	3	2	2	3	2	3	2	3	3	3	3	3	0.51	0.26
F3 F25	4	2	2	4	4	2	4	2	4	2	2	2	2	2	2	2	0.99	0.99
F3 F26	1	0	1	0	1	0	0	1	0	1	0	0	0	1	0	1	0.51	0.26
F3 F27	3	2	2	3	3	2	3	2	3	2	2	3	3	3	3	2	0.51	0.26
F3 F28	3	2	3	2	3	2	2	3	3	2	3	3	2	3	2	3	0.51	0.26
F3 F29	3	2	2	3	3	2	2	3	3	2	3	2	2	2	2	2	0.51	0.26
F3 F31	4	2	2	4	4	2	4	2	4	2	2	4	4	2	4	2	1.04	1.08
F3 F32	1	0	1	0	1	0	0	1	0	1	0	1	0	0	0	0	0.51	0.26
F3 F33	2	1	1	2	2	1	2	1	2	1	1	1	2	1	2	2	0.51	0.26
F3 F34	1	0	1	0	1	0	0	1	1	0	0	1	1	1	1	1	0.51	0.26
F3 F35	1	0	0	1	1	0	0	1	1	0	0	0	1	1	1	1	0.52	0.27
F4 F5	1	0	0	1	1	0	1	0	1	0	0	1	1	1	1	1	0.51	0.26
F4 F6	2	1	2	1	2	1	1	2	2	1	2	2	1	2	1	1	0.51	0.26
F4 F7	1	0	0	1	1	0	0	1	1	0	1	0	0	0	0	0	0.51	0.26
F4 F8	4	3	4	3	4	3	3	4	3	4	3	3	3	3	3	3	0.50	0.25
F4 F9	4	3	3	4	4	3	4	3	4	3	3	4	4	3	4	4	0.52	0.27
F4 F10	4	3	4	3	4	3	3	4	3	4	3	4	3	3	3	4	0.51	0.26
F4 F11	1	0	0	1	1	0	1	0	1	0	0	0	1	0	1	1	0.51	0.26
F4 F12	2	1	2	1	2	1	1	2	2	1	1	2	2	2	2	2	0.51	0.26
F4 F13	3	2	2	3	3	2	2	3	3	2	2	2	3	3	3	2	0.52	0.27
F4 F14	4	3	4	3	4	3	3	4	3	4	3	4	4	4	4	3	0.51	0.26
F4 F15	4	2	2	4	4	2	4	2	4	2	2	2	2	2	2	2	0.99	0.99
F4 F16	2	1	2	1	2	1	1	2	1	2	1	1	1	2	1	1	0.51	0.26
F4 F19	4	3	3	4	4	3	3	4	4	3	4	3	3	3	3	4	0.51	0.26
F4 F20	4	3	4	3	4	3	3	4	3	4	3	3	3	3	3	3	0.50	0.25
F4 F21	4	3	3	4	4	3	4	3	4	3	3	4	4	3	4	4	0.52	0.27
F4 F22	4	3	4	3	4	3	3	4	3	4	3	4	3	3	3	4	0.51	0.26
F4 F23	2	0	0	2	2	0	2	0	2	0	0	0	2	0	2	0	1.03	1.05
F4 F24	4	3	4	3	4	3	3	4	4	3	3	4	4	4	4	4	0.51	0.26
F4 F25	3	2	2	3	3	2	2	3	3	2	2	2	3	3	3	2	0.52	0.27
F4 F26	3	2	3	2	3	2	2	3	2	3	2	3	3	3	3	3	0.51	0.26
F4 F27	3	2	2	3	3	2	3	2	3	2	2	2	2	2	2	2	0.50	0.25
F4 F28	4	3	4	3	4	3	3	4	3	4	3	3	3	4	3	3	0.51	0.26
F4 F29	4	3	3	4	4	3	4	3	4	3	3	4	4	4	4	4	0.51	0.26
F4 F31	3	2	2	3	3	2	2	3	3	2	3	2	2	2	2	2	0.51	0.26
F4 F32	2	1	2	1	2	1	1	2	1	2	1	1	1	1	1	2	0.50	0.25
F4 F33	3	2	2	3	3	2	3	2	3	2	2	3	3	2	3	2	0.52	0.27
F4 F34	4	3	4	3	4	3	3	4	3	4	3	4	3	3	3	3	0.51	0.26
F4 F35	4	3	3	4	4	3	4	3	4	3	3	3	4	3	4	3	0.51	0.26
F5 F6	3	2	2	3	3	2	3	2	3	2	2	2	2	2	2	3	0.50	0.25

Table F1 Continued

	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	R16	Standard Deviation	Square of Standard Deviation
F5 F7	1	0	1	0	1	0	0	1	0	1	0	0	0	1	0	0	0.51	0.26
F5 F8	3	2	2	3	3	2	3	2	3	2	2	3	3	3	3	3	0.51	0.26
F5 F9	4	3	4	3	4	3	3	4	4	3	4	4	3	4	3	4	0.51	0.26
F5 F10	4	3	3	4	4	3	3	4	4	3	4	3	3	3	3	3	0.51	0.26
F5 F11	4	3	4	3	4	3	3	4	3	4	3	3	3	3	3	3	0.50	0.25
F5 F12	4	3	3	4	4	3	4	3	4	3	3	4	4	3	4	4	0.52	0.27
F5 F13	3	2	3	2	3	2	2	3	2	3	2	3	2	2	2	2	0.51	0.26
F5 F14	3	1	1	3	3	1	3	1	3	1	1	1	3	1	3	1	1.03	1.05
F5 F15	3	2	3	2	3	2	2	3	3	2	2	3	3	3	3	2	0.51	0.26
F5 F16	1	0	0	1	1	0	0	1	1	0	0	0	1	1	1	1	0.52	0.27
F5 F19	2	1	2	1	2	1	1	2	1	2	1	1	1	2	1	2	0.51	0.26
F5 F20	3	2	2	3	3	2	3	2	3	2	2	3	3	3	3	2	0.51	0.26
F5 F21	4	3	4	3	4	3	3	4	4	3	4	4	3	4	3	4	0.51	0.26
F5 F22	4	3	3	4	4	3	3	4	4	3	4	3	3	3	3	3	0.51	0.26
F5 F23	4	3	4	3	4	3	3	4	3	4	3	3	3	3	3	3	0.50	0.25
F5 F24	4	3	3	4	4	3	4	3	4	3	3	4	4	3	4	3	0.52	0.27
F5 F25	4	3	4	3	4	3	3	4	3	4	3	4	3	3	3	3	0.51	0.26
F5 F26	4	3	3	4	4	3	4	3	4	3	3	3	4	3	4	4	0.51	0.26
F5 F27	4	3	4	3	4	3	3	4	4	3	3	4	4	4	4	4	0.51	0.26
F5 F28	3	2	2	3	3	2	2	3	3	2	2	2	3	3	3	3	0.52	0.27
F5 F29	3	2	3	2	3	2	2	3	2	3	2	3	3	3	3	3	0.51	0.26
F5 F31	3	2	3	2	3	2	2	3	2	3	2	2	2	3	2	2	0.51	0.26
F5 F32	3	2	2	3	3	2	3	2	3	2	2	3	3	3	3	3	0.51	0.26
F5 F33	3	2	3	2	3	2	2	3	3	2	3	3	2	3	2	2	0.51	0.26
F5 F34	3	2	2	3	3	2	2	3	3	2	3	2	2	2	2	2	0.51	0.26
F5 F35	3	2	3	2	3	2	2	3	2	3	2	2	2	2	2	2	0.50	0.25
F6 F7	1	0	1	0	1	0	0	1	1	0	0	1	1	1	1	1	0.51	0.26
F6 F8	4	3	3	4	4	3	3	4	4	3	3	3	4	4	4	3	0.52	0.27
F6 F9	4	3	4	3	4	3	3	4	3	4	3	4	4	4	4	3	0.51	0.26
F6 F10	4	3	3	4	4	3	4	3	4	3	3	3	3	3	3	3	0.50	0.25
F6 F11	4	2	4	2	4	2	2	4	2	4	2	2	2	4	2	2	1.03	1.05
F6 F12	3	2	2	3	3	2	3	2	3	2	2	3	3	3	3	2	0.51	0.26
F6 F13	4	2	4	2	4	2	2	4	4	2	4	4	2	4	2	2	1.03	1.05
F6 F14	3	2	2	3	3	2	2	3	3	2	3	2	2	2	2	3	0.51	0.26
F6 F15	3	2	3	2	3	2	2	3	2	3	2	2	2	2	2	2	0.50	0.25
F6 F16	2	1	1	2	2	1	2	1	2	1	1	2	2	1	2	2	0.52	0.27
F6 F19	2	1	2	1	2	1	1	2	2	1	1	2	2	2	2	2	0.51	0.26
F6 F20	2	1	1	2	2	1	1	2	2	1	1	1	2	2	2	1	0.52	0.27
F6 F21	4	3	4	3	4	3	3	4	3	4	3	4	4	4	4	4	0.51	0.26
F6 F22	4	3	3	4	4	3	4	3	4	3	3	3	3	3	3	3	0.50	0.25
F6 F23	2	1	2	1	2	1	1	2	1	2	1	1	1	2	1	1	0.51	0.26
F6 F24	4	2	2	4	4	2	4	2	4	2	2	4	4	4	4	4	1.03	1.05
F6 F25	3	2	3	2	3	2	2	3	3	2	3	3	2	3	2	3	0.51	0.26

Table F1 Continued

	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	R16	Standard Deviation	Square of Standard Deviation
F6 F26	3	2	2	3	3	2	2	3	3	2	3	2	2	2	2	2	0.51	0.26
F6 F27	3	2	3	2	3	2	2	3	2	3	2	2	2	2	2	3	0.50	0.25
F6 F28	3	2	2	3	3	2	3	2	3	2	2	3	3	2	3	2	0.52	0.27
F6 F29	4	3	4	3	4	3	3	4	3	4	3	4	3	3	3	3	0.51	0.26
F6 F31	3	2	3	2	3	2	2	3	3	2	2	3	3	3	3	3	0.51	0.26
F6 F32	2	1	1	2	2	1	1	2	2	1	1	1	2	2	2	1	0.52	0.27
F6 F33	4	2	4	2	4	2	2	4	2	4	2	4	4	4	4	2	1.03	1.05
F6 F34	3	2	2	3	3	2	3	2	3	2	2	2	2	2	2	3	0.50	0.25
F6 F35	3	2	3	2	3	2	2	3	2	3	2	2	2	3	2	2	0.51	0.26
F7 F8	2	1	2	1	2	1	1	2	1	2	1	1	1	1	1	1	0.50	0.25
F7 F9	2	1	1	2	2	1	2	1	2	1	1	2	2	1	2	2	0.52	0.27
F7 F10	2	1	2	1	2	1	1	2	1	2	1	2	1	1	1	1	0.51	0.26
F7 F11	4	3	3	4	4	3	4	3	4	3	3	3	4	3	4	3	0.51	0.26
F7 F12	3	2	3	2	3	2	2	3	3	2	2	3	3	3	3	2	0.51	0.26
F7 F13	3	2	2	3	3	2	2	3	3	2	2	2	3	3	3	3	0.52	0.27
F7 F14	2	1	2	1	2	1	1	2	1	2	1	2	2	2	2	2	0.51	0.26
F7 F15	2	1	1	2	2	1	2	1	2	1	1	1	1	1	1	1	0.50	0.25
F7 F16	2	1	2	1	2	1	1	2	1	2	1	1	1	2	1	2	0.51	0.26
F7 F19	1	0	0	1	1	0	0	1	1	0	1	0	0	0	0	0	0.51	0.26
F7 F20	2	1	2	1	2	1	1	2	1	2	1	1	1	1	1	1	0.50	0.25
F7 F21	2	1	1	2	2	1	2	1	2	1	1	2	2	1	2	1	0.52	0.27
F7 F22	1	0	1	0	1	0	0	1	0	1	0	1	0	0	0	0	0.51	0.26
F7 F23	1	0	0	1	1	0	1	0	1	0	0	0	1	0	1	1	0.51	0.26
F7 F24	3	2	3	2	3	2	2	3	3	2	2	3	3	3	3	3	0.51	0.26
F7 F25	1	0	0	1	1	0	0	1	1	0	0	0	1	1	1	1	0.52	0.27
F7 F26	1	0	1	0	1	0	0	1	0	1	0	1	1	1	1	1	0.51	0.26
F7 F27	2	1	1	2	2	1	2	1	2	1	1	1	1	1	1	1	0.50	0.25
F7 F28	3	2	3	2	3	2	2	3	2	3	2	2	2	3	2	2	0.51	0.26
F7 F29	3	2	2	3	3	2	3	2	3	2	2	3	3	3	3	3	0.51	0.26
F7 F31	4	3	3	4	4	3	3	4	4	3	4	3	3	3	3	3	0.51	0.26
F7 F32	2	1	2	1	2	1	1	2	1	2	1	1	1	1	1	1	0.50	0.25
F7 F33	3	2	2	3	3	2	3	2	3	2	2	3	3	2	3	3	0.52	0.27
F7 F34	2	1	2	1	2	1	1	2	1	2	1	2	1	1	1	2	0.51	0.26
F7 F35	3	2	2	3	3	2	3	2	3	2	2	2	3	2	3	3	0.51	0.26
F8 F9	4	3	3	4	4	3	4	3	4	3	3	3	3	3	3	3	0.50	0.25
F8 F10	4	3	4	3	4	3	3	4	3	4	3	3	3	4	3	3	0.51	0.26
F8 F11	2	1	1	2	2	1	2	1	2	1	1	2	2	2	2	1	0.51	0.26
F8 F12	4	3	4	3	4	3	3	4	4	3	4	4	3	4	3	3	0.51	0.26
F8 F13	4	3	3	4	4	3	3	4	4	3	4	3	3	3	3	4	0.51	0.26
F8 F14	4	3	4	3	4	3	3	4	3	4	3	3	3	3	3	3	0.50	0.25
F8 F15	4	2	2	4	4	2	4	2	4	2	2	4	4	2	4	4	1.04	1.08
F8 F16	3	2	3	2	3	2	2	3	2	3	2	3	2	2	2	3	0.51	0.26
F8 F19	4	3	3	4	4	3	3	4	4	3	3	3	4	4	4	3	0.52	0.27

Table F1 Continued

	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	R16	Standard Deviation	Square of Standard Deviation
F8 F20	2	1	2	1	2	1	1	2	1	2	1	2	2	2	2	2	0.51	0.26
F8 F21	4	3	3	4	4	3	4	3	4	3	3	3	3	3	3	3	0.50	0.25
F8 F22	4	3	4	3	4	3	3	4	3	4	3	3	3	4	3	3	0.51	0.26
F8 F23	3	2	2	3	3	2	3	2	3	2	2	3	3	3	3	3	0.51	0.26
F8 F24	3	2	3	2	3	2	2	3	3	2	3	3	2	3	2	3	0.51	0.26
F8 F25	3	2	2	3	3	2	2	3	3	2	3	2	2	2	2	2	0.51	0.26
F8 F26	3	2	3	2	3	2	2	3	2	3	2	2	2	2	2	3	0.50	0.25
F8 F27	3	2	2	3	3	2	3	2	3	2	2	3	3	2	3	2	0.52	0.27
F8 F28	4	3	4	3	4	3	3	4	3	4	3	4	3	3	3	3	0.51	0.26
F8 F29	4	3	3	4	4	3	4	3	4	3	3	3	4	3	4	3	0.51	0.26
F8 F31	3	2	2	3	3	2	2	3	3	2	2	2	3	3	3	2	0.52	0.27
F8 F32	2	1	2	1	2	1	1	2	1	2	1	2	2	2	2	1	0.51	0.26
F8 F33	4	3	3	4	4	3	4	3	4	3	3	3	3	3	3	4	0.50	0.25
F8 F34	4	3	4	3	4	3	3	4	3	4	3	3	3	4	3	3	0.51	0.26
F8 F35	4	2	2	4	4	2	4	2	4	2	2	4	4	4	4	4	1.03	1.05
F9 F10	4	3	3	4	4	3	4	3	4	3	3	4	4	3	4	4	0.52	0.27
F9 F11	3	2	3	2	3	2	2	3	2	3	2	3	2	2	2	2	0.51	0.26
F9 F12	3	2	2	3	3	2	3	2	3	2	2	2	3	2	3	2	0.51	0.26
F9 F13	3	2	3	2	3	2	2	3	3	2	2	3	3	3	3	2	0.51	0.26
F9 F14	4	3	3	4	4	3	3	4	4	3	3	3	4	4	4	4	0.52	0.27
F9 F15	4	3	4	3	4	3	3	4	3	4	3	4	4	4	4	4	0.51	0.26
F9 F16	4	3	3	4	4	3	4	3	4	3	3	3	3	3	3	3	0.50	0.25
F9 F19	4	3	4	3	4	3	3	4	4	3	4	4	3	4	3	4	0.51	0.26
F9 F20	3	2	2	3	3	2	2	3	3	2	3	2	2	2	2	2	0.51	0.26
F9 F21	3	1	3	1	3	1	1	3	1	3	1	1	1	1	1	1	0.99	0.99
F9 F22	4	3	3	4	4	3	4	3	4	3	3	4	4	3	4	3	0.52	0.27
F9 F23	2	1	2	1	2	1	1	2	1	2	1	2	1	1	1	1	0.51	0.26
F9 F24	4	2	2	4	4	2	4	2	4	2	2	2	4	2	4	4	1.03	1.05
F9 F25	3	2	3	2	3	2	2	3	3	2	2	3	3	3	3	3	0.51	0.26
F9 F26	3	2	2	3	3	2	2	3	3	2	2	2	3	3	3	3	0.52	0.27
F9 F27	3	2	3	2	3	2	2	3	2	3	2	3	3	3	3	3	0.51	0.26
F9 F28	3	2	2	3	3	2	3	2	3	2	2	2	2	2	2	2	0.50	0.25
F9 F29	4	3	4	3	4	3	3	4	3	4	3	3	3	4	3	3	0.51	0.26
F9 F31	4	3	4	3	4	3	3	4	4	3	4	4	3	4	3	3	0.51	0.26
F9 F32	4	3	3	4	4	3	3	4	4	3	4	3	3	3	3	3	0.51	0.26
F9 F33	4	3	4	3	4	3	3	4	3	4	3	3	3	3	3	3	0.50	0.25
F9 F34	4	3	3	4	4	3	4	3	4	3	3	4	4	3	4	4	0.52	0.27
F9 F35	4	3	4	3	4	3	3	4	3	4	3	4	3	3	3	4	0.51	0.26
F10 F11	2	1	2	1	2	1	1	2	1	2	1	2	2	2	2	1	0.51	0.26
F10 F12	4	3	3	4	4	3	4	3	4	3	3	3	3	3	3	3	0.50	0.25
F10 F13	4	2	4	2	4	2	2	4	2	4	2	2	2	4	2	2	1.03	1.05
F10 F14	4	2	2	4	4	2	4	2	4	2	2	4	4	4	4	2	1.03	1.05
F10 F15	2	1	2	1	2	1	1	2	2	1	2	2	1	2	1	1	0.51	0.26

Table F1 Continued

	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	R16	Standard Deviation	Square of Standard Deviation
F10 F16	1	0	0	1	1	0	0	1	1	0	1	0	0	0	0	1	0.51	0.26
F10 F19	1	0	1	0	1	0	0	1	0	1	0	1	0	0	0	1	0.51	0.26
F10 F20	2	1	1	2	2	1	2	1	2	1	1	1	2	1	2	1	0.51	0.26
F10 F21	2	1	2	1	2	1	1	2	2	1	1	2	2	2	2	2	0.51	0.26
F10 F22	4	3	3	4	4	3	3	4	4	3	3	3	4	4	4	3	0.52	0.27
F10 F23	3	2	3	2	3	2	2	3	2	3	2	3	3	3	3	3	0.51	0.26
F10 F24	3	2	2	3	3	2	3	2	3	2	2	2	2	2	2	2	0.50	0.25
F10 F25	3	2	3	2	3	2	2	3	2	3	2	2	2	3	2	2	0.51	0.26
F10 F26	1	0	0	1	1	0	1	0	1	0	0	1	1	1	1	1	0.51	0.26
F10 F27	2	1	2	1	2	1	1	2	2	1	2	2	1	2	1	2	0.51	0.26
F10 F28	4	3	3	4	4	3	3	4	4	3	4	3	3	3	3	3	0.51	0.26
F10 F29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	0.00
F10 F31	4	3	4	3	4	3	3	4	3	4	3	4	3	3	3	3	0.51	0.26
F10 F32	2	1	1	2	2	1	2	1	2	1	1	1	2	1	2	1	0.51	0.26
F10 F33	3	2	3	2	3	2	2	3	3	2	2	3	3	3	3	3	0.51	0.26
F10 F34	4	3	3	4	4	3	3	4	4	3	3	3	4	4	4	3	0.52	0.27
F10 F35	3	2	3	2	3	2	2	3	2	3	2	3	3	3	3	2	0.51	0.26
F11 F12	3	2	3	2	3	2	2	3	3	2	3	3	2	3	2	3	0.51	0.26
F11 F13	3	2	2	3	3	2	2	3	3	2	3	2	2	2	2	2	0.51	0.26
F11 F14	1	0	1	0	1	0	0	1	0	1	0	0	0	0	0	0	0.50	0.25
F11 F15	2	1	1	2	2	1	2	1	2	1	1	2	2	1	2	2	0.52	0.27
F11 F16	2	1	2	1	2	1	1	2	1	2	1	2	1	1	1	1	0.51	0.26
F11 F19	1	0	0	1	1	0	0	1	1	0	0	0	1	1	1	1	0.52	0.27
F11 F20	1	0	1	0	1	0	0	1	0	1	0	1	1	1	1	1	0.51	0.26
F11 F21	2	1	1	2	2	1	2	1	2	1	1	1	1	1	1	1	0.50	0.25
F11 F22	3	1	3	1	3	1	1	3	1	3	1	1	1	3	1	3	1.03	1.05
F11 F23	2	1	1	2	2	1	2	1	2	1	1	2	2	2	2	1	0.51	0.26
F11 F24	4	2	4	2	4	2	2	4	4	2	4	4	2	4	2	4	1.03	1.05
F11 F25	2	1	1	2	2	1	1	2	2	1	2	1	1	1	1	1	0.51	0.26
F11 F26	2	1	2	1	2	1	1	2	1	2	1	1	1	1	1	1	0.50	0.25
F11 F27	2	1	1	2	2	1	2	1	2	1	1	2	2	1	2	1	0.52	0.27
F11 F28	2	1	2	1	2	1	1	2	1	2	1	2	1	1	1	1	0.51	0.26
F11 F29	3	2	2	3	3	2	3	2	3	2	2	2	3	2	3	3	0.51	0.26
F11 F31	3	2	2	3	3	2	2	3	3	2	2	2	3	3	3	3	0.52	0.27
F11 F32	3	2	3	2	3	2	2	3	2	3	2	3	3	3	3	3	0.51	0.26
F11 F33	3	2	2	3	3	2	3	2	3	2	2	2	2	2	2	2	0.50	0.25
F11 F34	4	2	4	2	4	2	2	4	2	4	2	2	2	4	2	2	1.03	1.05
F11 F35	4	2	2	4	4	2	4	2	4	2	2	4	4	4	4	4	1.03	1.05
F12 F13	3	2	2	3	3	2	3	2	3	2	2	3	3	2	3	3	0.52	0.27
F12 F14	1	0	1	0	1	0	0	1	0	1	0	1	0	0	0	1	0.51	0.26
F12 F15	1	0	0	1	1	0	1	0	1	0	0	0	1	0	1	1	0.51	0.26
F12 F16	1	0	1	0	1	0	0	1	1	0	0	1	1	1	1	1	0.51	0.26
F12 F19	1	0	0	1	1	0	1	0	1	0	0	0	0	0	0	0	0.50	0.25

Table F1 Continued

	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	R16	Standard Deviation	Square of Standard Deviation
F12 F20	3	1	3	1	3	1	1	3	1	3	1	1	1	3	1	1	1.03	1.05
F12 F21	1	0	0	1	1	0	1	0	1	0	0	1	1	1	1	0	0.51	0.26
F12 F22	3	2	3	2	3	2	2	3	3	2	3	3	2	3	2	2	0.51	0.26
F12 F23	2	1	1	2	2	1	1	2	2	1	2	1	1	1	1	2	0.51	0.26
F12 F24	3	2	3	2	3	2	2	3	2	3	2	2	2	2	2	2	0.50	0.25
F12 F25	2	1	1	2	2	1	2	1	2	1	1	2	2	1	2	2	0.52	0.27
F12 F26	2	1	2	1	2	1	1	2	1	2	1	2	1	1	1	2	0.51	0.26
F12 F27	2	1	1	2	2	1	2	1	2	1	1	1	2	1	2	1	0.51	0.26
F12 F28	4	3	4	3	4	3	3	4	4	3	3	4	4	4	4	4	0.51	0.26
F12 F29	4	3	3	4	4	3	3	4	4	3	3	3	4	4	4	3	0.52	0.27
F12 F31	3	2	2	3	3	2	3	2	3	2	2	2	2	2	2	2	0.50	0.25
F12 F32	3	1	3	1	3	1	1	3	1	3	1	1	1	3	1	1	1.03	1.05
F12 F33	3	1	1	3	3	1	3	1	3	1	1	3	3	3	3	3	1.03	1.05
F12 F34	2	1	2	1	2	1	1	2	2	1	2	2	1	2	1	2	0.51	0.26
F12 F35	2	1	1	2	2	1	1	2	2	1	2	1	1	1	1	1	0.51	0.26
F13 F14	2	1	1	2	2	1	2	1	2	1	1	1	2	1	2	1	0.51	0.26
F13 F15	2	1	2	1	2	1	1	2	2	1	1	2	2	2	2	2	0.51	0.26
F13 F16	2	1	1	2	2	1	1	2	2	1	1	1	2	2	2	1	0.52	0.27
F13 F19	1	0	1	0	1	0	0	1	0	1	0	0	0	1	0	0	0.51	0.26
F13 F20	3	2	2	3	3	2	3	2	3	2	2	3	3	3	3	3	0.51	0.26
F13 F21	3	2	3	2	3	2	2	3	3	2	3	3	2	3	2	3	0.51	0.26
F13 F22	4	2	2	4	4	2	2	4	4	2	4	2	2	2	2	2	1.03	1.05
F13 F23	3	1	3	1	3	1	1	3	1	3	1	1	1	1	1	1	0.99	0.99
F13 F24	3	2	2	3	3	2	3	2	3	2	2	3	3	2	3	3	0.52	0.27
F13 F25	3	2	3	2	3	2	2	3	2	3	2	3	2	2	2	2	0.51	0.26
F13 F26	3	2	2	3	3	2	3	2	3	2	2	2	3	2	3	2	0.51	0.26
F13 F27	3	2	3	2	3	2	2	3	3	2	2	3	3	3	3	2	0.51	0.26
F13 F28	4	3	3	4	4	3	3	4	4	3	3	3	4	4	4	4	0.52	0.27
F13 F29	4	3	4	3	4	3	3	4	3	4	3	4	4	4	4	4	0.51	0.26
F13 F31	3	2	3	2	3	2	2	3	2	3	2	2	2	3	2	3	0.51	0.26
F13 F32	4	3	3	4	4	3	4	3	4	3	3	4	4	4	4	3	0.51	0.26
F13 F33	4	3	4	3	4	3	3	4	4	3	4	4	3	4	3	4	0.51	0.26
F13 F34	3	2	2	3	3	2	2	3	3	2	3	2	2	2	2	2	0.51	0.26
F13 F35	3	2	3	2	3	2	2	3	2	3	2	2	2	2	2	2	0.50	0.25
F14 F15	4	3	4	3	4	3	3	4	4	3	3	4	4	4	4	4	0.51	0.26
F14 F16	4	3	3	4	4	3	3	4	4	3	3	3	4	4	4	4	0.52	0.27
F14 F19	4	3	4	3	4	3	3	4	3	4	3	3	3	4	3	3	0.51	0.26
F14 F20	1	0	0	1	1	0	1	0	1	0	0	1	1	1	1	1	0.51	0.26
F14 F21	4	3	4	3	4	3	3	4	4	3	4	4	3	4	3	3	0.51	0.26
F14 F22	4	3	3	4	4	3	3	4	4	3	4	3	3	3	3	3	0.51	0.26
F14 F23	3	2	3	2	3	2	2	3	2	3	2	2	2	2	2	2	0.50	0.25
F14 F24	4	3	3	4	4	3	4	3	4	3	3	4	4	3	4	4	0.52	0.27
F14 F25	4	3	4	3	4	3	3	4	3	4	3	4	3	3	3	4	0.51	0.26

Table F1 Continued

	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	R16	Standard Deviation	Square of Standard Deviation
F14 F26	2	1	1	2	2	1	2	1	2	1	1	1	2	1	2	2	0.51	0.26
F14 F27	4	3	4	3	4	3	3	4	4	3	3	4	4	4	4	4	0.51	0.26
F14 F28	4	3	3	4	4	3	3	4	4	3	3	3	4	4	4	3	0.52	0.27
F14 F29	4	3	4	3	4	3	3	4	3	4	3	4	4	4	4	3	0.51	0.26
F14 F31	2	1	2	1	2	1	1	2	1	2	1	1	1	2	1	1	0.51	0.26
F14 F32	3	2	2	3	3	2	3	2	3	2	2	3	3	3	3	2	0.51	0.26
F14 F33	3	2	3	2	3	2	2	3	3	2	3	3	2	3	2	2	0.51	0.26
F14 F34	4	3	3	4	4	3	3	4	4	3	4	3	3	3	3	4	0.51	0.26
F14 F35	4	3	4	3	4	3	3	4	3	4	3	3	3	3	3	3	0.50	0.25
F15 F16	3	2	3	2	3	2	2	3	3	2	2	3	3	3	3	3	0.51	0.26
F15 F19	2	1	1	2	2	1	2	1	2	1	1	1	1	1	1	1	0.50	0.25
F15 F20	4	3	4	3	4	3	3	4	3	4	3	3	3	4	3	3	0.51	0.26
F15 F21	2	1	1	2	2	1	2	1	2	1	1	2	2	2	2	2	0.51	0.26
F15 F22	4	2	4	2	4	2	2	4	4	2	4	4	2	4	2	4	1.03	1.05
F15 F23	4	3	3	4	4	3	3	4	4	3	4	3	3	3	3	3	0.51	0.26
F15 F24	3	2	3	2	3	2	2	3	2	3	2	2	2	2	2	3	0.50	0.25
F15 F25	3	2	2	3	3	2	3	2	3	2	2	3	3	2	3	2	0.52	0.27
F15 F26	2	1	2	1	2	1	1	2	1	2	1	2	1	1	1	1	0.51	0.26
F15 F27	3	0	0	3	3	0	3	0	3	0	0	0	3	0	3	0	1.54	2.37
F15 F28	4	3	4	3	4	3	3	4	4	3	3	4	4	4	4	4	0.51	0.26
F15 F29	4	3	3	4	4	3	3	4	4	3	3	3	4	4	4	3	0.52	0.27
F15 F31	2	1	1	2	2	1	2	1	2	1	1	1	1	1	1	2	0.50	0.25
F15 F32	4	2	4	2	4	2	2	4	2	4	2	2	2	4	2	2	1.03	1.05
F15 F33	4	3	3	4	4	3	4	3	4	3	3	4	4	4	4	4	0.51	0.26
F15 F34	4	3	4	3	4	3	3	4	4	3	4	4	3	4	3	4	0.51	0.26
F15 F35	4	3	3	4	4	3	3	4	4	3	4	3	3	3	3	3	0.51	0.26
F16 F19	3	2	2	3	3	2	2	3	3	2	2	2	3	3	3	3	0.52	0.27
F16 F20	4	2	4	2	4	2	2	4	2	4	2	4	4	4	4	4	1.03	1.05
F16 F21	3	2	2	3	3	2	3	2	3	2	2	2	2	2	2	2	0.50	0.25
F16 F22	3	2	3	2	3	2	2	3	2	3	2	2	2	3	2	3	0.51	0.26
F16 F23	4	3	3	4	4	3	4	3	4	3	3	4	4	4	4	3	0.51	0.26
F16 F24	4	3	4	3	4	3	3	4	4	3	4	4	3	4	3	4	0.51	0.26
F16 F25	3	2	2	3	3	2	2	3	3	2	3	2	2	2	2	2	0.51	0.26
F16 F26	2	1	2	1	2	1	1	2	1	2	1	1	1	1	1	1	0.50	0.25
F16 F27	3	2	2	3	3	2	3	2	3	2	2	3	3	2	3	2	0.52	0.27
F16 F28	3	2	3	2	3	2	2	3	2	3	2	3	2	2	2	2	0.51	0.26
F16 F29	3	2	2	3	3	2	3	2	3	2	2	2	3	2	3	3	0.51	0.26
F16 F31	4	3	3	4	4	3	3	4	4	3	3	3	4	4	4	4	0.52	0.27
F16 F32	3	2	3	2	3	2	2	3	2	3	2	3	3	3	3	3	0.51	0.26
F16 F33	4	3	3	4	4	3	4	3	4	3	3	3	3	3	3	3	0.50	0.25
F16 F34	4	3	4	3	4	3	3	4	3	4	3	3	3	4	3	3	0.51	0.26
F16 F35	4	3	3	4	4	3	4	3	4	3	3	4	4	4	4	4	0.51	0.26
F19 F20	4	2	4	2	4	2	2	4	2	4	2	4	4	4	4	4	1.03	1.05

Table F1 Continued

	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	R16	Standard Deviation	Square of Standard Deviation
F19 F21	4	3	3	4	4	3	4	3	4	3	3	3	3	3	3	3	0.50	0.25
F19 F22	4	2	4	2	4	2	2	4	2	4	2	2	2	4	2	4	1.03	1.05
F19 F23	4	3	3	4	4	3	4	3	4	3	3	4	4	4	4	3	0.51	0.26
F19 F24	4	3	4	3	4	3	3	4	4	3	4	4	3	4	3	4	0.51	0.26
F19 F25	4	3	3	4	4	3	3	4	4	3	4	3	3	3	3	3	0.51	0.26
F19 F26	3	1	3	1	3	1	1	3	1	3	1	1	1	1	1	1	0.99	0.99
F19 F27	3	2	2	3	3	2	3	2	3	2	2	3	3	2	3	2	0.52	0.27
F19 F28	4	3	4	3	4	3	3	4	3	4	3	4	3	3	3	3	0.51	0.26
F19 F29	3	2	2	3	3	2	3	2	3	2	2	2	3	2	3	3	0.51	0.26
F19 F31	3	2	2	3	3	2	2	3	3	2	2	2	3	3	3	3	0.52	0.27
F19 F32	4	3	4	3	4	3	3	4	3	4	3	4	4	4	4	4	0.51	0.26
F19 F33	4	3	3	4	4	3	4	3	4	3	3	3	3	3	3	3	0.50	0.25
F19 F34	4	3	4	3	4	3	3	4	3	4	3	3	3	4	3	3	0.51	0.26
F19 F35	4	3	3	4	4	3	4	3	4	3	3	4	4	4	4	4	0.51	0.26
F20 F21	3	2	2	3	3	2	3	2	3	2	2	3	3	2	3	3	0.52	0.27
F20 F22	2	1	2	1	2	1	1	2	1	2	1	2	1	1	1	2	0.51	0.26
F20 F23	2	1	1	2	2	1	2	1	2	1	1	1	2	1	2	2	0.51	0.26
F20 F24	1	0	1	0	1	0	0	1	1	0	0	1	1	1	1	1	0.51	0.26
F20 F25	2	1	1	2	2	1	1	2	2	1	1	1	2	2	2	1	0.52	0.27
F20 F26	2	1	2	1	2	1	1	2	1	2	1	2	2	2	2	1	0.51	0.26
F20 F27	3	2	2	3	3	2	3	2	3	2	2	2	2	2	2	2	0.50	0.25
F20 F28	3	2	3	2	3	2	2	3	2	3	2	2	2	3	2	2	0.51	0.26
F20 F29	4	2	2	4	4	2	4	2	4	2	2	4	4	4	4	2	1.03	1.05
F20 F31	2	1	1	2	2	1	1	2	2	1	2	1	1	1	1	2	0.51	0.26
F20 F32	3	2	3	2	3	2	2	3	2	3	2	2	2	2	2	2	0.50	0.25
F20 F33	4	2	2	4	4	2	4	2	4	2	2	4	4	2	4	4	1.04	1.08
F20 F34	3	2	3	2	3	2	2	3	2	3	2	3	2	2	2	3	0.51	0.26
F20 F35	2	1	1	2	2	1	2	1	2	1	1	1	2	1	2	1	0.51	0.26
F21 F22	4	3	3	4	4	3	4	3	4	3	3	3	3	3	3	3	0.50	0.25
F21 F23	2	1	2	1	2	1	1	2	1	2	1	1	1	2	1	1	0.51	0.26
F21 F24	4	3	3	4	4	3	4	3	4	3	3	4	4	4	4	4	0.51	0.26
F21 F25	4	3	4	3	4	3	3	4	4	3	4	4	3	4	3	4	0.51	0.26
F21 F26	4	3	3	4	4	3	3	4	4	3	4	3	3	3	3	3	0.51	0.26
F21 F27	4	3	4	3	4	3	3	4	3	4	3	3	3	3	3	4	0.50	0.25
F21 F28	4	3	3	4	4	3	4	3	4	3	3	4	4	3	4	3	0.52	0.27
F21 F29	4	3	4	3	4	3	3	4	3	4	3	4	3	3	3	3	0.51	0.26
F21 F31	3	1	3	1	3	1	1	3	3	1	1	3	3	3	3	3	1.03	1.05
F21 F32	2	1	1	2	2	1	1	2	2	1	1	1	2	2	2	1	0.52	0.27
F21 F33	4	3	4	3	4	3	3	4	3	4	3	4	4	4	4	3	0.51	0.26
F21 F34	4	3	3	4	4	3	4	3	4	3	3	3	3	3	3	4	0.50	0.25
F21 F35	4	3	4	3	4	3	3	4	3	4	3	3	3	4	3	3	0.51	0.26
F22 F23	2	1	2	1	2	1	1	2	1	2	1	1	1	1	1	1	0.50	0.25
F22 F24	4	2	2	4	4	2	4	2	4	2	2	4	4	2	4	4	1.04	1.08

Table F1 Continued

	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	R16	Standard Deviation	Square of Standard Deviation
F22 F25	3	2	3	2	3	2	2	3	2	3	2	3	2	2	2	2	0.51	0.26
F22 F26	2	1	1	2	2	1	2	1	2	1	1	1	2	1	2	1	0.51	0.26
F22 F27	4	3	4	3	4	3	3	4	4	3	3	4	4	4	4	3	0.51	0.26
F22 F28	4	3	3	4	4	3	3	4	4	3	3	3	4	4	4	4	0.52	0.27
F22 F29	4	3	4	3	4	3	3	4	3	4	3	4	4	4	4	4	0.51	0.26
F22 F31	3	2	3	2	3	2	2	3	2	3	2	2	2	3	2	3	0.51	0.26
F22 F32	3	1	1	3	3	1	3	1	3	1	1	3	3	3	3	1	1.03	1.05
F22 F33	4	3	4	3	4	3	3	4	4	3	4	4	3	4	3	4	0.51	0.26
F22 F34	4	3	3	4	4	3	3	4	4	3	4	3	3	3	3	3	0.51	0.26
F22 F35	4	3	4	3	4	3	3	4	3	4	3	3	3	3	3	3	0.50	0.25
F23 F24	4	3	4	3	4	3	3	4	4	3	3	4	4	4	4	4	0.51	0.26
F23 F25	3	2	2	3	3	2	2	3	3	2	2	2	3	3	3	3	0.52	0.27
F23 F26	3	1	3	1	3	1	1	3	1	3	1	3	3	3	3	3	1.03	1.05
F23 F27	4	3	3	4	4	3	4	3	4	3	3	3	3	3	3	3	0.50	0.25
F23 F28	4	3	4	3	4	3	3	4	3	4	3	3	3	4	3	3	0.51	0.26
F23 F29	4	2	2	4	4	2	4	2	4	2	2	4	4	4	4	4	1.03	1.05
F23 F31	2	1	1	2	2	1	1	2	2	1	2	1	1	1	1	1	0.51	0.26
F23 F32	4	3	4	3	4	3	3	4	3	4	3	3	3	3	3	3	0.50	0.25
F23 F33	4	3	3	4	4	3	4	3	4	3	3	4	4	3	4	4	0.52	0.27
F23 F34	4	3	4	3	4	3	3	4	3	4	3	4	3	3	3	4	0.51	0.26
F23 F35	4	3	3	4	4	3	4	3	4	3	3	3	4	3	4	4	0.51	0.26
F24 F25	3	1	1	3	3	1	3	1	3	1	1	1	1	1	1	1	0.99	0.99
F24 F26	1	0	1	0	1	0	0	1	0	1	0	0	0	1	0	0	0.51	0.26
F24 F27	4	3	3	4	4	3	4	3	4	3	3	4	4	4	4	3	0.51	0.26
F24 F28	4	3	4	3	4	3	3	4	4	3	4	4	3	4	3	3	0.51	0.26
F24 F29	2	1	1	2	2	1	1	2	2	1	2	1	1	1	1	2	0.51	0.26
F24 F31	3	2	2	3	3	2	3	2	3	2	2	3	3	2	3	3	0.52	0.27
F24 F32	3	2	3	2	3	2	2	3	2	3	2	3	2	2	2	3	0.51	0.26
F24 F33	3	2	2	3	3	2	3	2	3	2	2	2	3	2	3	2	0.51	0.26
F24 F34	3	2	3	2	3	2	2	3	3	2	2	3	3	3	3	3	0.51	0.26
F24 F35	4	2	2	4	4	2	2	4	4	2	2	2	4	4	4	2	1.04	1.08
F25 F26	4	3	3	4	4	3	4	3	4	3	3	4	4	4	4	4	0.51	0.26
F25 F27	4	3	4	3	4	3	3	4	4	3	4	4	3	4	3	4	0.51	0.26
F25 F28	4	3	3	4	4	3	3	4	4	3	4	3	3	3	3	3	0.51	0.26
F25 F29	4	3	4	3	4	3	3	4	3	4	3	3	3	3	3	4	0.50	0.25
F25 F31	3	2	3	2	3	2	2	3	2	3	2	3	2	2	2	2	0.51	0.26
F25 F32	3	2	2	3	3	2	3	2	3	2	2	2	3	2	3	2	0.51	0.26
F25 F33	3	2	3	2	3	2	2	3	3	2	2	3	3	3	3	3	0.51	0.26
F25 F34	4	3	3	4	4	3	3	4	4	3	3	3	4	4	4	3	0.52	0.27
F25 F35	4	3	4	3	4	3	3	4	3	4	3	4	4	4	4	3	0.51	0.26
F26 F27	4	3	4	3	4	3	3	4	4	3	4	4	3	4	3	4	0.51	0.26
F26 F28	4	3	3	4	4	3	3	4	4	3	4	3	3	3	3	3	0.51	0.26
F26 F29	4	3	4	3	4	3	3	4	3	4	3	3	3	3	3	3	0.50	0.25

Table F1 Continued

	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	R16	Standard Deviation	Square of Standard Deviation
F26 F31	4	3	4	3	4	3	3	4	3	4	3	4	3	3	3	3	0.51	0.26
F26 F32	3	2	2	3	3	2	3	2	3	2	2	2	3	2	3	2	0.51	0.26
F26 F33	4	3	4	3	4	3	3	4	4	3	3	4	4	4	4	3	0.51	0.26
F26 F34	4	3	3	4	4	3	3	4	4	3	3	3	4	4	4	4	0.52	0.27
F26 F35	4	3	4	3	4	3	3	4	3	4	3	4	4	4	4	4	0.51	0.26
F27 F28	4	3	4	3	4	3	3	4	4	3	4	4	3	4	3	4	0.51	0.26
F27 F29	4	3	3	4	4	3	3	4	4	3	4	3	3	3	3	3	0.51	0.26
F27 F31	4	2	2	4	4	2	4	2	4	2	2	4	4	2	4	2	1.04	1.08
F27 F32	4	3	4	3	4	3	3	4	3	4	3	4	3	3	3	3	0.51	0.26
F27 F33	4	3	3	4	4	3	4	3	4	3	3	3	4	3	4	4	0.51	0.26
F27 F34	4	3	4	3	4	3	3	4	4	3	3	4	4	4	4	4	0.51	0.26
F27 F35	4	3	3	4	4	3	3	4	4	3	3	3	4	4	4	4	0.52	0.27
F28 F29	4	3	3	4	4	3	4	3	4	3	3	4	4	4	4	4	0.51	0.26
F28 F31	3	2	2	3	3	2	2	3	3	2	3	2	2	2	2	2	0.51	0.26
F28 F32	3	2	3	2	3	2	2	3	2	3	2	2	2	2	2	2	0.50	0.25
F28 F33	3	2	2	3	3	2	3	2	3	2	2	3	3	2	3	3	0.52	0.27
F28 F34	3	1	3	1	3	1	1	3	1	3	1	3	1	1	1	3	1.03	1.05
F28 F35	3	1	1	3	3	1	3	1	3	1	1	1	3	1	3	3	1.03	1.05
F29 F31	2	1	2	1	2	1	1	2	1	2	1	1	1	2	1	1	0.51	0.26
F29 F32	3	1	1	3	3	1	3	1	3	1	1	3	3	3	3	1	1.03	1.05
F29 F33	4	3	4	3	4	3	3	4	4	3	4	4	3	4	3	3	0.51	0.26
F29 F34	4	3	3	4	4	3	3	4	4	3	4	3	3	3	3	4	0.51	0.26
F29 F35	4	3	4	3	4	3	3	4	3	4	3	3	3	3	3	3	0.50	0.25
F31 F32	4	2	4	2	4	2	2	4	2	4	2	2	2	2	2	4	0.99	0.99
F31 F33	4	3	3	4	4	3	4	3	4	3	3	4	4	3	4	3	0.52	0.27
F31 F34	3	2	3	2	3	2	2	3	2	3	2	3	2	2	2	2	0.51	0.26
F31 F35	3	2	2	3	3	2	3	2	3	2	2	2	3	2	3	2	0.51	0.26
F32 F33	4	3	3	4	4	3	4	3	4	3	3	3	3	3	3	4	0.50	0.25
F32 F34	3	2	3	2	3	2	2	3	2	3	2	2	2	3	2	2	0.51	0.26
F32 F35	3	2	2	3	3	2	3	2	3	2	2	3	3	3	3	3	0.51	0.26
F33 F34	4	2	2	4	4	2	4	2	4	2	2	4	4	2	4	4	1.04	1.08
F33 F35	4	2	4	2	4	2	2	4	2	4	2	4	2	2	2	2	1.03	1.05
F34 F35	4	3	4	3	4	3	3	4	3	4	3	4	4	4	4	4	0.51	0.26
F2 F1	3	2	3	2	3	2	3	2	3	2	2	3	3	3	3	3	0.51	0.26
F3 F1	4	2	2	4	4	2	2	4	2	4	2	4	2	2	2	2	1.03	1.05
F4 F1	4	3	4	3	4	3	4	3	4	3	3	3	4	3	4	4	0.51	0.26
F5 F1	4	3	3	4	4	3	4	3	3	4	4	3	4	3	4	3	0.52	0.27
F6 F1	4	3	4	3	4	3	4	3	3	4	4	4	4	3	4	4	0.51	0.26
F7 F1	4	3	3	4	4	3	3	4	3	4	3	4	3	3	3	3	0.51	0.26
F8 F1	3	2	3	2	3	2	3	2	3	2	2	2	3	2	3	2	0.51	0.26
F9 F1	3	1	1	3	3	1	1	3	1	3	1	1	3	3	3	1	1.04	1.08
F10 F1	3	2	3	2	3	2	3	2	3	2	2	3	3	2	3	3	0.52	0.27
F11 F1	4	2	2	4	4	2	4	2	2	4	2	2	4	2	4	4	1.03	1.05

Table F1 Continued

	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	R16	Standard Deviation	Square of Standard Deviation
F12 F1	3	2	3	2	3	2	3	2	2	3	2	3	2	2	2	3	0.51	0.26
F13 F1	3	2	2	3	3	2	2	3	2	3	2	2	2	3	2	2	0.51	0.26
F14 F1	2	1	2	1	2	1	2	1	2	1	1	2	2	2	2	2	0.51	0.26
F15 F1	3	2	2	3	3	2	2	3	2	3	2	3	2	2	2	3	0.51	0.26
F16 F1	3	2	3	2	3	2	3	2	3	2	2	2	3	2	3	3	0.51	0.26
F19 F1	2	1	1	2	2	1	1	2	1	2	1	2	1	1	1	1	0.51	0.26
F20 F1	2	1	2	1	2	1	2	1	2	1	1	1	2	1	2	1	0.51	0.26
F21 F1	3	2	2	3	3	2	2	3	2	3	2	2	3	3	3	3	0.52	0.27
F22 F1	4	2	4	2	4	2	4	2	4	2	2	4	4	2	4	4	1.04	1.08
F23 F1	2	1	1	2	2	1	2	1	1	2	1	1	2	1	2	1	0.51	0.26
F24 F1	3	2	3	2	3	2	3	2	2	3	2	3	2	2	2	2	0.51	0.26
F25 F1	4	3	3	4	4	3	3	4	3	4	3	3	3	4	3	3	0.51	0.26
F26 F1	4	3	4	3	4	3	4	3	4	3	3	4	4	4	4	4	0.51	0.26
F27 F1	3	2	2	3	3	2	2	3	2	3	2	3	2	2	2	2	0.51	0.26
F28 F1	2	1	2	1	2	1	2	1	2	1	1	1	2	1	2	1	0.51	0.26
F29 F1	4	3	3	4	4	3	4	3	3	4	4	3	4	3	4	3	0.52	0.27
F31 F1	4	3	3	4	4	3	3	4	3	4	3	4	3	3	3	3	0.51	0.26
F32 F1	3	2	3	2	3	2	3	2	3	2	2	2	3	2	3	3	0.51	0.26
F33 F1	3	1	1	3	3	1	1	3	1	3	1	1	3	3	3	1	1.04	1.08
F34 F1	2	1	2	1	2	1	2	1	2	1	1	2	2	1	2	2	0.52	0.27
F35 F1	2	1	1	2	2	1	2	1	1	2	1	1	2	1	2	1	0.51	0.26
F3 F2	3	2	2	3	3	2	2	3	2	3	2	3	2	2	2	2	0.51	0.26
F4 F2	3	2	3	2	3	2	3	2	3	2	2	2	3	2	3	2	0.51	0.26
F5 F2	3	2	2	3	3	2	3	2	2	3	3	2	3	2	3	3	0.52	0.27
F6 F2	4	2	4	2	4	2	4	2	2	4	4	4	4	2	4	4	1.03	1.05
F7 F2	4	2	2	4	4	2	2	4	2	4	2	4	2	2	2	2	1.03	1.05
F8 F2	4	2	4	2	4	2	4	2	4	2	2	2	4	2	4	4	1.03	1.05
F9 F2	4	3	3	4	4	3	3	4	3	4	3	3	4	4	4	3	0.52	0.27
F10 F2	4	3	4	3	4	3	4	3	4	3	3	4	4	3	4	4	0.52	0.27
F11 F2	4	3	3	4	4	3	4	3	3	4	3	3	4	3	4	3	0.51	0.26
F12 F2	3	2	3	2	3	2	3	2	2	3	2	3	2	2	2	2	0.51	0.26
F13 F2	3	2	2	3	3	2	2	3	2	3	2	2	2	3	2	2	0.51	0.26
F14 F2	4	3	4	3	4	3	4	3	4	3	3	4	4	4	4	4	0.51	0.26
F15 F2	4	3	3	4	4	3	3	4	3	4	3	4	3	3	3	3	0.51	0.26
F16 F2	4	3	4	3	4	3	4	3	4	3	3	3	4	3	4	4	0.51	0.26
F19 F2	4	3	3	4	4	3	3	4	3	4	3	4	3	3	3	4	0.51	0.26
F20 F2	2	1	2	1	2	1	2	1	2	1	1	1	2	1	2	2	0.51	0.26
F21 F2	3	2	2	3	3	2	2	3	2	3	2	2	3	3	3	2	0.52	0.27
F22 F2	4	2	4	2	4	2	4	2	4	2	2	4	4	2	4	2	1.04	1.08
F23 F2	3	2	2	3	3	2	3	2	2	3	2	2	3	2	3	2	0.51	0.26
F24 F2	4	3	4	3	4	3	4	3	3	4	3	4	3	3	3	4	0.51	0.26
F25 F2	4	3	3	4	4	3	3	4	3	4	3	3	3	4	3	3	0.51	0.26
F26 F2	4	3	4	3	4	3	4	3	4	3	3	4	4	4	4	4	0.51	0.26

Table F1 Continued

	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	R16	Standard Deviation	Square of Standard Deviation
F27 F2	3	2	2	3	3	2	2	3	2	3	2	3	2	2	2	2	0.51	0.26
F28 F2	4	3	4	3	4	3	4	3	4	3	3	3	4	3	4	4	0.51	0.26
F29 F2	4	3	3	4	4	3	4	3	3	4	4	3	4	3	4	3	0.52	0.27
F31 F2	4	3	3	4	4	3	3	4	3	4	3	4	3	3	3	3	0.51	0.26
F32 F2	4	2	4	2	4	2	4	2	4	2	2	2	4	2	4	2	1.03	1.05
F33 F2	4	3	3	4	4	3	3	4	3	4	3	3	4	4	4	3	0.52	0.27
F34 F2	3	2	3	2	3	2	3	2	3	2	2	3	3	2	3	3	0.52	0.27
F35 F2	3	2	2	3	3	2	3	2	2	3	2	2	3	2	3	3	0.51	0.26
F4 F3	4	3	3	4	4	3	3	4	3	4	3	4	3	3	3	4	0.51	0.26
F5 F3	3	2	3	2	3	2	3	2	3	2	2	2	3	2	3	3	0.51	0.26
F6 F3	4	3	3	4	4	3	4	3	3	4	4	3	4	3	4	3	0.52	0.27
F7 F3	3	2	3	2	3	2	3	2	2	3	3	3	3	2	3	2	0.51	0.26
F8 F3	3	2	2	3	3	2	2	3	2	3	2	3	2	2	2	2	0.51	0.26
F9 F3	2	1	2	1	2	1	2	1	2	1	1	1	2	1	2	1	0.51	0.26
F10 F3	3	2	2	3	3	2	2	3	2	3	2	2	3	3	3	3	0.52	0.27
F11 F3	4	3	4	3	4	3	4	3	4	3	3	4	4	3	4	4	0.52	0.27
F12 F3	2	0	0	2	2	0	2	0	0	2	0	0	2	0	2	0	1.03	1.05
F13 F3	3	2	3	2	3	2	3	2	2	3	2	3	2	2	2	2	0.51	0.26
F14 F3	2	1	1	2	2	1	1	2	1	2	1	1	1	2	1	1	0.51	0.26
F15 F3	2	1	2	1	2	1	2	1	2	1	1	2	2	2	2	2	0.51	0.26
F16 F3	4	2	2	4	4	2	2	4	2	4	2	4	2	2	2	2	1.03	1.05
F19 F3	2	1	2	1	2	1	2	1	1	2	2	2	2	1	2	2	0.51	0.26
F20 F3	2	1	1	2	2	1	1	2	1	2	1	2	1	1	1	1	0.51	0.26
F21 F3	3	2	3	2	3	2	3	2	3	2	2	2	3	2	3	3	0.51	0.26
F22 F3	4	3	3	4	4	3	3	4	3	4	3	3	4	4	4	3	0.52	0.27
F23 F3	2	1	2	1	2	1	2	1	2	1	1	2	2	1	2	2	0.52	0.27
F24 F3	2	1	1	2	2	1	2	1	1	2	1	1	2	1	2	1	0.51	0.26
F25 F3	4	3	4	3	4	3	4	3	3	4	3	4	3	3	3	3	0.51	0.26
F26 F3	3	2	2	3	3	2	2	3	2	3	2	2	2	3	2	2	0.51	0.26
F27 F3	4	3	4	3	4	3	4	3	4	3	3	4	4	4	4	3	0.51	0.26
F28 F3	2	1	1	2	2	1	1	2	1	2	1	2	1	1	1	1	0.51	0.26
F29 F3	3	2	3	2	3	2	3	2	3	2	2	2	3	2	3	2	0.51	0.26
F31 F3	4	2	4	2	4	2	4	2	2	4	4	4	4	2	4	4	1.03	1.05
F32 F3	3	2	2	3	3	2	2	3	2	3	2	3	2	2	2	2	0.51	0.26
F33 F3	3	2	3	2	3	2	3	2	3	2	2	2	3	2	3	3	0.51	0.26
F34 F3	3	2	2	3	3	2	2	3	2	3	2	2	3	3	3	2	0.52	0.27
F35 F3	3	2	3	2	3	2	3	2	3	2	2	3	3	2	3	3	0.52	0.27
F5 F4	3	2	3	2	3	2	3	2	3	2	2	3	3	3	3	3	0.51	0.26
F6 F4	3	2	2	3	3	2	2	3	2	3	2	3	2	2	2	2	0.51	0.26
F7 F4	1	0	1	0	1	0	1	0	1	0	0	0	1	0	1	1	0.51	0.26
F8 F4	4	3	3	4	4	3	4	3	3	4	4	3	4	3	4	3	0.52	0.27
F9 F4	3	2	3	2	3	2	3	2	2	3	3	3	3	2	3	2	0.51	0.26
F10 F4	2	1	1	2	2	1	1	2	1	2	1	2	1	1	1	2	0.51	0.26

Table F1 Continued

	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	R16	Standard Deviation	Square of Standard Deviation
F11 F4	3	1	3	1	3	1	3	1	3	1	1	1	3	1	3	3	1.03	1.05
F12 F4	2	1	1	2	2	1	1	2	1	2	1	1	2	2	2	1	0.52	0.27
F13 F4	2	1	2	1	2	1	2	1	2	1	1	2	2	1	2	1	0.52	0.27
F14 F4	4	3	3	4	4	3	4	3	3	4	3	3	4	3	4	3	0.51	0.26
F15 F4	3	2	3	2	3	2	3	2	2	3	2	3	2	2	2	3	0.51	0.26
F16 F4	3	2	2	3	3	2	2	3	2	3	2	2	2	3	2	2	0.51	0.26
F19 F4	4	3	4	3	4	3	4	3	4	3	3	3	4	3	4	4	0.51	0.26
F20 F4	1	0	0	1	1	0	1	0	0	1	1	0	1	0	1	0	0.52	0.27
F21 F4	3	1	3	1	3	1	3	1	1	3	3	3	3	1	3	3	1.03	1.05
F22 F4	4	3	3	4	4	3	3	4	3	4	3	4	3	3	3	3	0.51	0.26
F23 F4	4	3	4	3	4	3	4	3	4	3	3	3	4	3	4	3	0.51	0.26
F24 F4	1	0	0	1	1	0	0	1	0	1	0	0	1	1	1	0	0.52	0.27
F25 F4	3	2	3	2	3	2	3	2	3	2	2	3	3	2	3	3	0.52	0.27
F26 F4	2	1	1	2	2	1	2	1	1	2	1	1	2	1	2	2	0.51	0.26
F27 F4	3	2	3	2	3	2	3	2	2	3	2	3	2	2	2	3	0.51	0.26
F28 F4	1	0	0	1	1	0	0	1	0	1	0	0	0	1	0	0	0.51	0.26
F29 F4	4	2	4	2	4	2	4	2	4	2	2	4	4	4	4	4	1.03	1.05
F31 F4	3	2	3	2	3	2	3	2	3	2	2	2	3	2	3	3	0.51	0.26
F32 F4	1	0	0	1	1	0	1	0	0	1	1	0	1	0	1	0	0.52	0.27
F33 F4	3	1	3	1	3	1	3	1	1	3	3	3	3	1	3	1	1.03	1.05
F34 F4	2	1	1	2	2	1	1	2	1	2	1	2	1	1	1	1	0.51	0.26
F35 F4	4	3	4	3	4	3	4	3	4	3	3	3	4	3	4	3	0.51	0.26
F6 F5	4	3	4	3	4	3	4	3	3	4	3	4	3	3	3	3	0.51	0.26
F7 F5	4	3	3	4	4	3	3	4	3	4	3	3	3	4	3	3	0.51	0.26
F8 F5	2	1	2	1	2	1	2	1	2	1	1	2	2	2	2	2	0.51	0.26
F9 F5	4	2	2	4	4	2	2	4	2	4	2	4	2	2	2	2	1.03	1.05
F10 F5	2	1	2	1	2	1	2	1	2	1	1	1	2	1	2	1	0.51	0.26
F11 F5	2	1	1	2	2	1	2	1	1	2	2	1	2	1	2	1	0.52	0.27
F12 F5	3	2	3	2	3	2	3	2	2	3	3	3	3	2	3	3	0.51	0.26
F13 F5	1	0	0	1	1	0	0	1	0	1	0	1	0	0	0	0	0.51	0.26
F14 F5	1	0	1	0	1	0	1	0	1	0	0	0	1	0	1	1	0.51	0.26
F15 F5	1	0	0	1	1	0	0	1	0	1	0	0	1	1	1	0	0.52	0.27
F16 F5	1	0	1	0	1	0	1	0	1	0	0	1	1	0	1	1	0.52	0.27
F19 F5	3	2	2	3	3	2	2	3	2	3	2	2	2	3	2	2	0.51	0.26
F20 F5	2	1	2	1	2	1	2	1	2	1	1	2	2	2	2	1	0.51	0.26
F21 F5	3	2	2	3	3	2	2	3	2	3	2	3	2	2	2	2	0.51	0.26
F22 F5	3	1	3	1	3	1	3	1	3	1	1	1	3	1	3	1	1.03	1.05
F23 F5	3	2	2	3	3	2	3	2	2	3	3	2	3	2	3	3	0.52	0.27
F24 F5	3	2	3	2	3	2	3	2	2	3	3	3	3	2	3	3	0.51	0.26
F25 F5	4	3	3	4	4	3	3	4	3	4	3	4	3	3	3	3	0.51	0.26
F26 F5	3	2	3	2	3	2	3	2	3	2	2	2	3	2	3	3	0.51	0.26
F27 F5	4	2	2	4	4	2	2	4	2	4	2	2	4	4	4	2	1.04	1.08
F28 F5	3	2	3	2	3	2	3	2	3	2	2	3	3	2	3	3	0.52	0.27

Table F1 Continued

	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	R16	Standard Deviation	Square of Standard Deviation
F29 F5	3	2	2	3	3	2	3	2	2	3	2	2	3	2	3	2	0.51	0.26
F31 F5	4	2	2	4	4	2	2	4	2	4	2	2	2	4	2	2	1.03	1.05
F32 F5	3	2	3	2	3	2	3	2	3	2	2	3	3	3	3	3	0.51	0.26
F33 F5	3	2	2	3	3	2	2	3	2	3	2	3	2	2	2	2	0.51	0.26
F34 F5	4	3	4	3	4	3	4	3	4	3	3	3	4	3	4	4	0.51	0.26
F35 F5	4	3	3	4	4	3	4	3	3	4	4	3	4	3	4	3	0.52	0.27
F7 F6	2	1	1	2	2	1	1	2	1	2	1	1	2	2	2	1	0.52	0.27
F8 F6	4	3	4	3	4	3	4	3	4	3	3	4	4	3	4	3	0.52	0.27
F9 F6	4	3	3	4	4	3	4	3	3	4	3	3	4	3	4	3	0.51	0.26
F10 F6	4	3	4	3	4	3	4	3	3	4	3	4	3	3	3	4	0.51	0.26
F11 F6	2	1	1	2	2	1	1	2	1	2	1	1	1	2	1	1	0.51	0.26
F12 F6	3	2	3	2	3	2	3	2	3	2	2	3	3	3	3	3	0.51	0.26
F13 F6	3	2	2	3	3	2	2	3	2	3	2	3	2	2	2	2	0.51	0.26
F14 F6	3	1	3	1	3	1	3	1	3	1	1	1	3	1	3	3	1.03	1.05
F15 F6	3	2	2	3	3	2	3	2	2	3	3	2	3	2	3	2	0.52	0.27
F16 F6	3	2	3	2	3	2	3	2	2	3	3	3	3	2	3	3	0.51	0.26
F19 F6	3	2	2	3	3	2	2	3	2	3	2	2	3	3	3	2	0.52	0.27
F20 F6	3	2	3	2	3	2	3	2	3	2	2	3	3	2	3	3	0.52	0.27
F21 F6	4	3	3	4	4	3	4	3	3	4	3	3	4	3	4	4	0.51	0.26
F22 F6	4	3	4	3	4	3	4	3	3	4	3	4	3	3	3	4	0.51	0.26
F23 F6	4	3	3	4	4	3	3	4	3	4	3	3	3	4	3	3	0.51	0.26
F24 F6	4	2	4	2	4	2	4	2	4	2	2	4	4	4	4	4	1.03	1.05
F25 F6	4	3	3	4	4	3	3	4	3	4	3	4	3	3	3	4	0.51	0.26
F26 F6	4	3	4	3	4	3	4	3	4	3	3	3	4	3	4	4	0.51	0.26
F27 F6	4	3	3	4	4	3	4	3	3	4	4	3	4	3	4	3	0.52	0.27
F28 F6	4	3	4	3	4	3	4	3	3	4	4	4	4	3	4	3	0.51	0.26
F29 F6	4	3	3	4	4	3	3	4	3	4	3	4	3	3	3	3	0.51	0.26
F31 F6	4	3	3	4	4	3	3	4	3	4	3	3	4	4	4	4	0.52	0.27
F32 F6	4	3	4	3	4	3	4	3	4	3	3	4	4	3	4	4	0.52	0.27
F33 F6	4	3	3	4	4	3	4	3	3	4	3	3	4	3	4	3	0.51	0.26
F34 F6	4	3	4	3	4	3	4	3	3	4	3	4	3	3	3	3	0.51	0.26
F35 F6	3	2	2	3	3	2	2	3	2	3	2	2	2	3	2	2	0.51	0.26
F8 F7	1	0	0	1	1	0	1	0	0	1	1	0	1	0	1	0	0.52	0.27
F9 F7	3	2	3	2	3	2	3	2	2	3	3	3	3	2	3	3	0.51	0.26
F10 F7	3	2	2	3	3	2	2	3	2	3	2	3	2	2	2	2	0.51	0.26
F11 F7	2	1	2	1	2	1	2	1	2	1	1	1	2	1	2	2	0.51	0.26
F12 F7	3	2	2	3	3	2	2	3	2	3	2	2	3	3	3	2	0.52	0.27
F13 F7	3	2	3	2	3	2	3	2	3	2	2	3	3	2	3	3	0.52	0.27
F14 F7	1	0	0	1	1	0	1	0	0	1	0	0	1	0	1	0	0.51	0.26
F15 F7	1	0	1	0	1	0	1	0	0	1	0	1	0	0	0	0	0.51	0.26
F16 F7	1	0	0	1	1	0	0	1	0	1	0	0	0	1	0	0	0.51	0.26
F19 F7	1	0	1	0	1	0	1	0	1	0	0	0	1	0	1	0	0.51	0.26
F20 F7	1	0	0	1	1	0	1	0	0	1	1	0	1	0	1	1	0.52	0.27

Table F1 Continued

	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	R16	Standard Deviation	Square of Standard Deviation
F21 F7	3	2	3	2	3	2	3	2	2	3	3	3	3	2	3	3	0.51	0.26
F22 F7	2	1	1	2	2	1	1	2	1	2	1	2	1	1	1	1	0.51	0.26
F23 F7	1	0	1	0	1	0	1	0	1	0	0	0	1	0	1	1	0.51	0.26
F24 F7	4	3	3	4	4	3	3	4	3	4	3	3	4	4	4	3	0.52	0.27
F25 F7	3	2	3	2	3	2	3	2	3	2	2	3	3	2	3	3	0.52	0.27
F26 F7	3	2	2	3	3	2	3	2	2	3	2	2	3	2	3	2	0.51	0.26
F27 F7	3	2	3	2	3	2	3	2	2	3	2	3	2	2	2	2	0.51	0.26
F28 F7	2	1	1	2	2	1	1	2	1	2	1	1	1	2	1	1	0.51	0.26
F29 F7	2	1	2	1	2	1	2	1	2	1	1	2	2	2	2	2	0.51	0.26
F31 F7	4	3	4	3	4	3	4	3	4	3	3	3	4	3	4	4	0.51	0.26
F32 F7	3	2	2	3	3	2	3	2	2	3	3	2	3	2	3	2	0.52	0.27
F33 F7	3	2	3	2	3	2	3	2	2	3	3	3	3	2	3	2	0.51	0.26
F34 F7	3	2	2	3	3	2	2	3	2	3	2	3	2	2	2	3	0.51	0.26
F35 F7	4	3	4	3	4	3	4	3	4	3	3	3	4	3	4	4	0.51	0.26
F9 F8	3	2	3	2	3	2	3	2	2	3	2	3	2	2	2	3	0.51	0.26
F10 F8	3	2	2	3	3	2	2	3	2	3	2	2	2	3	2	2	0.51	0.26
F11 F8	2	1	2	1	2	1	2	1	2	1	1	2	2	2	2	2	0.51	0.26
F12 F8	2	1	1	2	2	1	1	2	1	2	1	2	1	1	1	1	0.51	0.26
F13 F8	2	1	2	1	2	1	2	1	2	1	1	1	2	1	2	2	0.51	0.26
F14 F8	4	3	3	4	4	3	4	3	3	4	4	3	4	3	4	3	0.52	0.27
F15 F8	4	2	4	2	4	2	4	2	2	4	4	4	4	2	4	4	1.03	1.05
F16 F8	3	1	1	3	3	1	1	3	1	3	1	3	1	1	1	1	1.03	1.05
F19 F8	3	2	3	2	3	2	3	2	3	2	2	3	3	2	3	3	0.52	0.27
F20 F8	3	2	2	3	3	2	3	2	2	3	2	2	3	2	3	3	0.51	0.26
F21 F8	4	2	4	2	4	2	4	2	2	4	2	4	2	2	2	4	1.03	1.05
F22 F8	4	3	3	4	4	3	3	4	3	4	3	3	3	4	3	3	0.51	0.26
F23 F8	4	2	4	2	4	2	4	2	4	2	2	4	4	4	4	4	1.03	1.05
F24 F8	3	2	2	3	3	2	2	3	2	3	2	3	2	2	2	3	0.51	0.26
F25 F8	4	3	4	3	4	3	4	3	4	3	3	3	4	3	4	4	0.51	0.26
F26 F8	4	3	3	4	4	3	4	3	3	4	4	3	4	3	4	3	0.52	0.27
F27 F8	4	3	4	3	4	3	4	3	3	4	4	4	4	3	4	3	0.51	0.26
F28 F8	4	3	3	4	4	3	3	4	3	4	3	4	3	3	3	3	0.51	0.26
F29 F8	4	3	4	3	4	3	4	3	4	3	3	3	4	3	4	3	0.51	0.26
F31 F8	4	2	4	2	4	2	4	2	4	2	2	4	4	2	4	4	1.04	1.08
F32 F8	3	2	2	3	3	2	3	2	2	3	2	2	3	2	3	2	0.51	0.26
F33 F8	3	2	3	2	3	2	3	2	2	3	2	3	2	2	2	2	0.51	0.26
F34 F8	4	3	3	4	4	3	3	4	3	4	3	3	3	4	3	3	0.51	0.26
F35 F8	4	3	4	3	4	3	4	3	4	3	3	4	4	4	4	4	0.51	0.26
F10 F9	4	3	4	3	4	3	4	3	3	4	4	4	4	3	4	4	0.51	0.26
F11 F9	4	3	3	4	4	3	3	4	3	4	3	4	3	3	3	3	0.51	0.26
F12 F9	3	2	3	2	3	2	3	2	3	2	2	2	3	2	3	3	0.51	0.26
F13 F9	3	2	2	3	3	2	2	3	2	3	2	2	3	3	3	2	0.52	0.27
F14 F9	4	3	4	3	4	3	4	3	4	3	3	4	4	3	4	4	0.52	0.27

Table F1 Continued

	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	R16	Standard Deviation	Square of Standard Deviation
F15 F9	4	3	3	4	4	3	4	3	3	4	3	3	4	3	4	3	0.51	0.26
F16 F9	4	3	4	3	4	3	4	3	3	4	3	4	3	3	3	3	0.51	0.26
F19 F9	4	3	3	4	4	3	3	4	3	4	3	4	3	3	3	3	0.51	0.26
F20 F9	2	1	2	1	2	1	2	1	2	1	1	1	2	1	2	1	0.51	0.26
F21 F9	4	3	3	4	4	3	4	3	3	4	4	3	4	3	4	4	0.52	0.27
F22 F9	4	3	4	3	4	3	4	3	3	4	4	4	4	3	4	4	0.51	0.26
F23 F9	4	3	3	4	4	3	3	4	3	4	3	4	3	3	3	3	0.51	0.26
F24 F9	4	3	4	3	4	3	4	3	4	3	3	3	4	3	4	4	0.51	0.26
F25 F9	4	3	3	4	4	3	3	4	3	4	3	3	4	4	4	3	0.52	0.27
F26 F9	4	2	4	2	4	2	4	2	4	2	2	4	4	2	4	4	1.04	1.08
F27 F9	4	3	3	4	4	3	4	3	3	4	3	3	4	3	4	3	0.51	0.26
F28 F9	4	3	4	3	4	3	4	3	3	4	3	4	3	3	3	3	0.51	0.26
F29 F9	4	3	3	4	4	3	3	4	3	4	3	3	3	4	3	3	0.51	0.26
F31 F9	4	3	3	4	4	3	3	4	3	4	3	4	3	3	3	3	0.51	0.26
F32 F9	4	3	4	3	4	3	4	3	4	3	3	3	4	3	4	4	0.51	0.26
F33 F9	4	3	3	4	4	3	4	3	3	4	4	3	4	3	4	3	0.52	0.27
F34 F9	4	3	4	3	4	3	4	3	3	4	4	4	4	3	4	3	0.51	0.26
F35 F9	4	3	3	4	4	3	3	4	3	4	3	4	3	3	3	4	0.51	0.26
F11 F10	3	2	2	3	3	2	3	2	2	3	2	2	3	2	3	2	0.51	0.26
F12 F10	3	2	3	2	3	2	3	2	2	3	2	3	2	2	2	3	0.51	0.26
F13 F10	3	2	2	3	3	2	2	3	2	3	2	2	2	3	2	2	0.51	0.26
F14 F10	4	3	4	3	4	3	4	3	4	3	3	4	4	4	4	4	0.51	0.26
F15 F10	4	3	3	4	4	3	3	4	3	4	3	4	3	3	3	3	0.51	0.26
F16 F10	4	2	4	2	4	2	4	2	4	2	2	2	4	2	4	4	1.03	1.05
F19 F10	3	2	2	3	3	2	2	3	2	3	2	3	2	2	2	2	0.51	0.26
F20 F10	2	1	2	1	2	1	2	1	2	1	1	1	2	1	2	1	0.51	0.26
F21 F10	4	3	3	4	4	3	3	4	3	4	3	3	4	4	4	3	0.52	0.27
F22 F10	4	3	4	3	4	3	4	3	4	3	3	4	4	3	4	4	0.52	0.27
F23 F10	4	3	3	4	4	3	4	3	3	4	3	3	4	3	4	4	0.51	0.26
F24 F10	4	3	4	3	4	3	4	3	3	4	3	4	3	3	3	4	0.51	0.26
F25 F10	4	2	2	4	4	2	2	4	2	4	2	2	2	4	2	2	1.03	1.05
F26 F10	3	1	3	1	3	1	3	1	3	1	1	3	3	3	3	3	1.03	1.05
F27 F10	2	1	1	2	2	1	1	2	1	2	1	2	1	1	1	2	0.51	0.26
F28 F10	4	3	4	3	4	3	4	3	4	3	3	3	4	3	4	4	0.51	0.26
F29 F10	4	3	3	4	4	3	4	3	3	4	4	3	4	3	4	3	0.52	0.27
F31 F10	3	2	2	3	3	2	2	3	2	3	2	3	2	2	2	2	0.51	0.26
F32 F10	3	2	3	2	3	2	3	2	3	2	2	2	3	2	3	2	0.51	0.26
F33 F10	2	1	1	2	2	1	1	2	1	2	1	1	2	2	2	2	0.52	0.27
F34 F10	3	2	3	2	3	2	3	2	3	2	2	3	3	2	3	3	0.52	0.27
F35 F10	3	2	2	3	3	2	3	2	2	3	2	2	3	2	3	2	0.51	0.26
F12 F11	4	3	3	4	4	3	3	4	3	4	3	4	3	3	3	3	0.51	0.26
F13 F11	2	1	2	1	2	1	2	1	2	1	1	1	2	1	2	1	0.51	0.26
F14 F11	2	1	1	2	2	1	2	1	1	2	2	1	2	1	2	1	0.52	0.27

Table F1 Continued

	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	R16	Standard Deviation	Square of Standard Deviation
F15 F11	1	0	1	0	1	0	1	0	0	1	1	1	1	0	1	1	0.51	0.26
F16 F11	2	1	1	2	2	1	1	2	1	2	1	2	1	1	1	1	0.51	0.26
F19 F11	1	0	1	0	1	0	1	0	1	0	0	1	1	0	1	1	0.52	0.27
F20 F11	2	1	1	2	2	1	2	1	1	2	1	1	2	1	2	1	0.51	0.26
F21 F11	2	1	2	1	2	1	2	1	1	2	1	2	1	1	1	1	0.51	0.26
F22 F11	3	2	2	3	3	2	2	3	2	3	2	2	2	3	2	2	0.51	0.26
F23 F11	2	1	2	1	2	1	2	1	2	1	1	2	2	2	2	1	0.51	0.26
F24 F11	3	2	2	3	3	2	2	3	2	3	2	3	2	2	2	2	0.51	0.26
F25 F11	3	2	3	2	3	2	3	2	3	2	2	2	3	2	3	2	0.51	0.26
F26 F11	3	2	2	3	3	2	3	2	2	3	3	2	3	2	3	3	0.52	0.27
F27 F11	4	3	4	3	4	3	4	3	3	4	4	4	4	3	4	4	0.51	0.26
F28 F11	3	2	2	3	3	2	2	3	2	3	2	3	2	2	2	2	0.51	0.26
F29 F11	3	2	3	2	3	2	3	2	3	2	2	2	3	2	3	3	0.51	0.26
F31 F11	4	3	4	3	4	3	4	3	4	3	3	4	4	3	4	4	0.52	0.27
F32 F11	3	2	2	3	3	2	3	2	2	3	2	2	3	2	3	2	0.51	0.26
F33 F11	3	2	3	2	3	2	3	2	2	3	2	3	2	2	2	2	0.51	0.26
F34 F11	3	2	2	3	3	2	2	3	2	3	2	2	2	3	2	2	0.51	0.26
F35 F11	3	2	3	2	3	2	3	2	3	2	2	3	3	3	3	3	0.51	0.26
F13 F12	3	2	3	2	3	2	3	2	2	3	3	3	3	2	3	2	0.51	0.26
F14 F12	3	2	2	3	3	2	2	3	2	3	2	3	2	2	2	3	0.51	0.26
F15 F12	3	2	3	2	3	2	3	2	3	2	2	2	3	2	3	3	0.51	0.26
F16 F12	3	2	2	3	3	2	2	3	2	3	2	2	3	3	3	2	0.52	0.27
F19 F12	2	1	2	1	2	1	2	1	1	2	1	2	1	1	1	2	0.51	0.26
F20 F12	2	1	1	2	2	1	1	2	1	2	1	1	1	2	1	1	0.51	0.26
F21 F12	4	3	4	3	4	3	4	3	4	3	3	4	4	4	4	4	0.51	0.26
F22 F12	4	3	3	4	4	3	3	4	3	4	3	4	3	3	3	3	0.51	0.26
F23 F12	3	2	3	2	3	2	3	2	3	2	2	2	3	2	3	3	0.51	0.26
F24 F12	3	2	2	3	3	2	3	2	2	3	3	2	3	2	3	2	0.52	0.27
F25 F12	4	3	4	3	4	3	4	3	3	4	4	4	4	3	4	4	0.51	0.26
F26 F12	4	3	3	4	4	3	3	4	3	4	3	4	3	3	3	3	0.51	0.26
F27 F12	4	3	4	3	4	3	4	3	4	3	3	3	4	3	4	3	0.51	0.26
F28 F12	4	3	3	4	4	3	3	4	3	4	3	3	4	4	4	3	0.52	0.27
F29 F12	4	3	4	3	4	3	4	3	4	3	3	4	4	3	4	4	0.52	0.27
F31 F12	4	3	4	3	4	3	4	3	3	4	3	4	3	3	3	4	0.51	0.26
F32 F12	3	2	2	3	3	2	2	3	2	3	2	2	2	3	2	2	0.51	0.26
F33 F12	4	3	4	3	4	3	4	3	4	3	3	4	4	4	4	4	0.51	0.26
F34 F12	3	2	2	3	3	2	2	3	2	3	2	3	2	2	2	3	0.51	0.26
F35 F12	3	2	3	2	3	2	3	2	3	2	2	2	3	2	3	3	0.51	0.26
F14 F13	4	3	4	3	4	3	4	3	4	3	3	3	4	3	4	3	0.51	0.26
F15 F13	4	3	3	4	4	3	3	4	3	4	3	3	4	4	4	4	0.52	0.27
F16 F13	4	3	4	3	4	3	4	3	4	3	3	4	4	3	4	4	0.52	0.27
F19 F13	4	3	3	4	4	3	3	4	3	4	3	3	3	4	3	3	0.51	0.26
F20 F13	3	2	3	2	3	2	3	2	3	2	2	3	3	3	3	3	0.51	0.26

Table F1 Continued

	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	R16	Standard Deviation	Square of Standard Deviation
F21 F13	4	3	3	4	4	3	3	4	3	4	3	4	3	3	3	3	0.51	0.26
F22 F13	4	3	4	3	4	3	4	3	4	3	3	3	4	3	4	3	0.51	0.26
F23 F13	4	3	3	4	4	3	4	3	3	4	4	3	4	3	4	3	0.52	0.27
F24 F13	4	3	4	3	4	3	4	3	3	4	4	4	4	3	4	4	0.51	0.26
F25 F13	4	3	3	4	4	3	3	4	3	4	3	4	3	3	3	3	0.51	0.26
F26 F13	4	3	4	3	4	3	4	3	4	3	3	3	4	3	4	4	0.51	0.26
F27 F13	4	3	3	4	4	3	3	4	3	4	3	3	4	4	4	3	0.52	0.27
F28 F13	4	3	4	3	4	3	4	3	4	3	3	4	4	3	4	4	0.52	0.27
F29 F13	4	3	3	4	4	3	4	3	3	4	3	3	4	3	4	3	0.51	0.26
F31 F13	4	3	3	4	4	3	3	4	3	4	3	3	3	4	3	3	0.51	0.26
F32 F13	4	3	4	3	4	3	4	3	4	3	3	4	4	4	4	3	0.51	0.26
F33 F13	4	3	3	4	4	3	3	4	3	4	3	4	3	3	3	3	0.51	0.26
F34 F13	4	3	4	3	4	3	4	3	4	3	3	3	4	3	4	3	0.51	0.26
F35 F13	4	3	3	4	4	3	4	3	3	4	4	3	4	3	4	4	0.52	0.27
F15 F14	4	3	3	4	4	3	3	4	3	4	3	3	4	4	4	3	0.52	0.27
F16 F14	2	1	2	1	2	1	2	1	2	1	1	2	2	1	2	2	0.52	0.27
F19 F14	4	3	3	4	4	3	3	4	3	4	3	3	3	4	3	3	0.51	0.26
F20 F14	3	2	3	2	3	2	3	2	3	2	2	3	3	3	3	3	0.51	0.26
F21 F14	3	2	2	3	3	2	2	3	2	3	2	3	2	2	2	2	0.51	0.26
F22 F14	4	3	4	3	4	3	4	3	4	3	3	3	4	3	4	4	0.51	0.26
F23 F14	3	2	2	3	3	2	3	2	2	3	3	2	3	2	3	2	0.52	0.27
F24 F14	4	3	4	3	4	3	4	3	3	4	4	4	4	3	4	3	0.51	0.26
F25 F14	4	3	3	4	4	3	3	4	3	4	3	4	3	3	3	4	0.51	0.26
F26 F14	4	3	4	3	4	3	4	3	4	3	3	3	4	3	4	4	0.51	0.26
F27 F14	4	3	3	4	4	3	3	4	3	4	3	3	4	4	4	3	0.52	0.27
F28 F14	4	3	4	3	4	3	4	3	4	3	3	4	4	3	4	3	0.52	0.27
F29 F14	4	3	3	4	4	3	4	3	3	4	3	3	4	3	4	3	0.51	0.26
F31 F14	3	2	2	3	3	2	2	3	2	3	2	2	2	3	2	2	0.51	0.26
F32 F14	4	3	4	3	4	3	4	3	4	3	3	4	4	4	4	4	0.51	0.26
F33 F14	4	3	3	4	4	3	3	4	3	4	3	4	3	3	3	3	0.51	0.26
F34 F14	4	3	4	3	4	3	4	3	4	3	3	3	4	3	4	4	0.51	0.26
F35 F14	4	3	3	4	4	3	4	3	3	4	4	3	4	3	4	3	0.52	0.27
F16 F15	2	1	1	2	2	1	1	2	1	2	1	1	2	2	2	1	0.52	0.27
F19 F15	4	3	4	3	4	3	4	3	3	4	3	4	3	3	3	4	0.51	0.26
F20 F15	2	1	1	2	2	1	1	2	1	2	1	1	1	2	1	1	0.51	0.26
F21 F15	4	3	4	3	4	3	4	3	4	3	3	4	4	4	4	4	0.51	0.26
F22 F15	4	3	3	4	4	3	3	4	3	4	3	4	3	3	3	4	0.51	0.26
F23 F15	4	3	4	3	4	3	4	3	4	3	3	3	4	3	4	4	0.51	0.26
F24 F15	1	0	0	1	1	0	1	0	0	1	1	0	1	0	1	0	0.52	0.27
F25 F15	3	2	3	2	3	2	3	2	2	3	3	3	3	2	3	2	0.51	0.26
F26 F15	2	1	1	2	2	1	1	2	1	2	1	2	1	1	1	1	0.51	0.26
F27 F15	3	2	3	2	3	2	3	2	3	2	2	2	3	2	3	2	0.51	0.26
F28 F15	3	1	1	3	3	1	1	3	1	3	1	1	3	3	3	3	1.04	1.08

Table F1 Continued

	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	R16	Standard Deviation	Square of Standard Deviation
F29 F15	3	1	3	1	3	1	3	1	3	1	1	3	3	1	3	3	1.04	1.08
F31 F15	3	1	3	1	3	1	3	1	1	3	1	3	1	1	1	1	1.03	1.05
F32 F15	4	3	3	4	4	3	3	4	3	4	3	3	3	4	3	3	0.51	0.26
F33 F15	4	3	4	3	4	3	4	3	4	3	3	4	4	4	4	4	0.51	0.26
F34 F15	3	2	2	3	3	2	2	3	2	3	2	3	2	2	2	2	0.51	0.26
F35 F15	2	1	2	1	2	1	2	1	2	1	1	1	2	1	2	1	0.51	0.26
F19 F16	4	3	4	3	4	3	4	3	4	3	3	4	4	3	4	4	0.52	0.27
F20 F16	3	1	1	3	3	1	3	1	1	3	1	1	3	1	3	1	1.03	1.05
F21 F16	1	0	1	0	1	0	1	0	0	1	0	1	0	0	0	0	0.51	0.26
F22 F16	2	1	1	2	2	1	1	2	1	2	1	1	1	2	1	1	0.51	0.26
F23 F16	4	3	4	3	4	3	4	3	4	3	3	4	4	4	4	3	0.51	0.26
F24 F16	1	0	0	1	1	0	0	1	0	1	0	1	0	0	0	0	0.51	0.26
F25 F16	2	0	2	0	2	0	2	0	2	0	0	0	2	0	2	0	1.03	1.05
F26 F16	2	0	0	2	2	0	2	0	0	2	2	0	2	0	2	2	1.04	1.08
F27 F16	2	1	2	1	2	1	2	1	1	2	2	2	2	1	2	2	0.51	0.26
F28 F16	1	0	0	1	1	0	0	1	0	1	0	1	0	0	0	0	0.51	0.26
F29 F16	1	0	1	0	1	0	1	0	1	0	0	0	1	0	1	1	0.51	0.26
F31 F16	2	1	2	1	2	1	2	1	2	1	1	2	2	1	2	2	0.52	0.27
F32 F16	3	2	2	3	3	2	3	2	2	3	2	2	3	2	3	2	0.51	0.26
F33 F16	4	3	4	3	4	3	4	3	3	4	3	4	3	3	3	3	0.51	0.26
F34 F16	3	1	1	3	3	1	1	3	1	3	1	1	1	3	1	1	1.03	1.05
F35 F16	2	1	2	1	2	1	2	1	2	1	1	2	2	2	2	2	0.51	0.26
F20 F19	1	0	0	1	1	0	1	0	0	1	0	0	1	0	1	0	0.51	0.26
F21 F19	2	1	2	1	2	1	2	1	1	2	1	2	1	1	1	1	0.51	0.26
F22 F19	3	2	2	3	3	2	2	3	2	3	2	2	2	3	2	2	0.51	0.26
F23 F19	4	2	4	2	4	2	4	2	4	2	2	4	4	4	4	2	1.03	1.05
F24 F19	2	1	1	2	2	1	1	2	1	2	1	2	1	1	1	1	0.51	0.26
F25 F19	4	3	4	3	4	3	4	3	4	3	3	3	4	3	4	3	0.51	0.26
F26 F19	4	3	3	4	4	3	4	3	3	4	4	3	4	3	4	4	0.52	0.27
F27 F19	4	3	4	3	4	3	4	3	3	4	4	4	4	3	4	4	0.51	0.26
F28 F19	2	1	1	2	2	1	1	2	1	2	1	2	1	1	1	1	0.51	0.26
F29 F19	2	1	2	1	2	1	2	1	2	1	1	1	2	1	2	2	0.51	0.26
F31 F19	2	0	2	0	2	0	2	0	2	0	0	2	2	0	2	2	1.04	1.08
F32 F19	2	1	1	2	2	1	2	1	1	2	1	1	2	1	2	1	0.51	0.26
F33 F19	4	3	4	3	4	3	4	3	3	4	3	4	3	3	3	3	0.51	0.26
F34 F19	4	3	3	4	4	3	3	4	3	4	3	3	3	4	3	3	0.51	0.26
F35 F19	2	1	2	1	2	1	2	1	2	1	1	2	2	2	2	2	0.51	0.26
F21 F20	1	0	1	0	1	0	1	0	0	1	1	1	1	0	1	0	0.51	0.26
F22 F20	4	3	3	4	4	3	3	4	3	4	3	4	3	3	3	4	0.51	0.26
F23 F20	3	2	3	2	3	2	3	2	3	2	2	2	3	2	3	3	0.51	0.26
F24 F20	2	1	1	2	2	1	1	2	1	2	1	1	2	2	2	1	0.52	0.27
F25 F20	2	1	2	1	2	1	2	1	2	1	1	2	2	1	2	1	0.52	0.27
F26 F20	3	2	2	3	3	2	3	2	2	3	2	2	3	2	3	2	0.51	0.26

Table F1 Continued

	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	R16	Standard Deviation	Square of Standard Deviation
F27 F20	3	2	3	2	3	2	3	2	2	3	2	3	2	2	2	3	0.51	0.26
F28 F20	3	2	2	3	3	2	2	3	2	3	2	2	2	3	2	2	0.51	0.26
F29 F20	4	2	4	2	4	2	4	2	4	2	2	4	4	4	4	4	1.03	1.05
F31 F20	4	3	4	3	4	3	4	3	4	3	3	3	4	3	4	4	0.51	0.26
F32 F20	4	3	3	4	4	3	4	3	3	4	4	3	4	3	4	3	0.52	0.27
F33 F20	4	2	4	2	4	2	4	2	2	4	4	4	4	2	4	4	1.03	1.05
F34 F20	4	3	3	4	4	3	3	4	3	4	3	4	3	3	3	3	0.51	0.26
F35 F20	4	2	4	2	4	2	4	2	4	2	2	2	4	2	4	2	1.03	1.05
F22 F21	4	3	4	3	4	3	4	3	3	4	3	4	3	3	3	4	0.51	0.26
F23 F21	4	3	3	4	4	3	3	4	3	4	3	3	3	4	3	3	0.51	0.26
F24 F21	1	0	1	0	1	0	1	0	1	0	0	1	1	1	1	1	0.51	0.26
F25 F21	4	3	3	4	4	3	3	4	3	4	3	4	3	3	3	4	0.51	0.26
F26 F21	4	3	4	3	4	3	4	3	4	3	3	3	4	3	4	4	0.51	0.26
F27 F21	4	3	3	4	4	3	4	3	3	4	4	3	4	3	4	3	0.52	0.27
F28 F21	4	3	4	3	4	3	4	3	3	4	4	4	4	3	4	3	0.51	0.26
F29 F21	4	3	3	4	4	3	3	4	3	4	3	4	3	3	3	3	0.51	0.26
F31 F21	3	1	1	3	3	1	1	3	1	3	1	1	3	3	3	3	1.04	1.08
F32 F21	4	3	4	3	4	3	4	3	4	3	3	4	4	3	4	4	0.52	0.27
F33 F21	4	2	2	4	4	2	4	2	2	4	2	2	4	2	4	2	1.03	1.05
F34 F21	4	3	4	3	4	3	4	3	3	4	3	4	3	3	3	3	0.51	0.26
F35 F21	2	0	0	2	2	0	0	2	0	2	0	0	0	2	0	0	1.03	1.05
F23 F22	3	2	2	3	3	2	3	2	2	3	3	2	3	2	3	2	0.52	0.27
F24 F22	3	1	3	1	3	1	3	1	1	3	3	3	3	1	3	3	1.03	1.05
F25 F22	3	2	2	3	3	2	2	3	2	3	2	3	2	2	2	2	0.51	0.26
F26 F22	3	2	3	2	3	2	3	2	3	2	2	2	3	2	3	3	0.51	0.26
F27 F22	3	2	2	3	3	2	2	3	2	3	2	2	3	3	3	2	0.52	0.27
F28 F22	4	3	4	3	4	3	4	3	4	3	3	4	4	3	4	4	0.52	0.27
F29 F22	4	3	3	4	4	3	4	3	3	4	3	3	4	3	4	3	0.51	0.26
F31 F22	3	2	2	3	3	2	2	3	2	3	2	2	2	3	2	2	0.51	0.26
F32 F22	4	3	4	3	4	3	4	3	4	3	3	4	4	4	4	3	0.51	0.26
F33 F22	3	2	2	3	3	2	2	3	2	3	2	3	2	2	2	2	0.51	0.26
F34 F22	3	2	3	2	3	2	3	2	3	2	2	2	3	2	3	2	0.51	0.26
F35 F22	3	2	2	3	3	2	3	2	2	3	3	2	3	2	3	3	0.52	0.27
F24 F23	1	0	0	1	1	0	0	1	0	1	0	0	1	1	1	0	0.52	0.27
F25 F23	4	3	4	3	4	3	4	3	4	3	3	4	4	3	4	4	0.52	0.27
F26 F23	4	3	3	4	4	3	4	3	3	4	3	3	4	3	4	3	0.51	0.26
F27 F23	4	3	4	3	4	3	4	3	3	4	3	4	3	3	3	3	0.51	0.26
F28 F23	2	1	1	2	2	1	1	2	1	2	1	1	1	2	1	1	0.51	0.26
F29 F23	3	2	3	2	3	2	3	2	3	2	2	3	3	3	3	3	0.51	0.26
F31 F23	4	2	4	2	4	2	4	2	4	2	2	2	4	2	4	4	1.03	1.05
F32 F23	4	3	3	4	4	3	4	3	3	4	4	3	4	3	4	3	0.52	0.27
F33 F23	4	3	4	3	4	3	4	3	3	4	4	4	4	3	4	3	0.51	0.26
F34 F23	4	3	3	4	4	3	3	4	3	4	3	4	3	3	3	4	0.51	0.26

Table F1 Continued

	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	R16	Standard Deviation	Square of Standard Deviation
F35 F23	4	3	4	3	4	3	4	3	4	3	3	3	4	3	4	4	0.51	0.26
F25 F24	4	3	4	3	4	3	4	3	3	4	3	4	3	3	3	4	0.51	0.26
F26 F24	4	2	2	4	4	2	2	4	2	4	2	2	2	4	2	2	1.03	1.05
F27 F24	4	3	4	3	4	3	4	3	4	3	3	4	4	4	4	4	0.51	0.26
F28 F24	2	1	1	2	2	1	1	2	1	2	1	2	1	1	1	1	0.51	0.26
F29 F24	3	2	3	2	3	2	3	2	3	2	2	2	3	2	3	3	0.51	0.26
F31 F24	3	1	3	1	3	1	3	1	1	3	3	3	3	1	3	3	1.03	1.05
F32 F24	4	3	3	4	4	3	3	4	3	4	3	4	3	3	3	3	0.51	0.26
F33 F24	4	3	4	3	4	3	4	3	4	3	3	3	4	3	4	3	0.51	0.26
F34 F24	4	3	3	4	4	3	3	4	3	4	3	3	4	4	4	3	0.52	0.27
F35 F24	4	3	4	3	4	3	4	3	4	3	3	4	4	3	4	4	0.52	0.27
F26 F25	3	2	3	2	3	2	3	2	3	2	2	3	3	3	3	3	0.51	0.26
F27 F25	3	2	2	3	3	2	2	3	2	3	2	3	2	2	2	3	0.51	0.26
F28 F25	3	1	3	1	3	1	3	1	3	1	1	1	3	1	3	3	1.03	1.05
F29 F25	3	2	2	3	3	2	3	2	2	3	3	2	3	2	3	2	0.52	0.27
F31 F25	4	3	3	4	4	3	3	4	3	4	3	4	3	3	3	3	0.51	0.26
F32 F25	4	2	4	2	4	2	4	2	4	2	2	2	4	2	4	2	1.03	1.05
F33 F25	4	3	3	4	4	3	3	4	3	4	3	3	4	4	4	4	0.52	0.27
F34 F25	4	3	4	3	4	3	4	3	4	3	3	4	4	3	4	4	0.52	0.27
F35 F25	4	2	2	4	4	2	4	2	2	4	2	2	4	2	4	2	1.03	1.05
F27 F26	2	1	1	2	2	1	1	2	1	2	1	2	1	1	1	1	0.51	0.26
F28 F26	1	0	1	0	1	0	1	0	1	0	0	0	1	0	1	0	0.51	0.26
F29 F26	2	0	0	2	2	0	2	0	0	2	2	0	2	0	2	0	1.04	1.08
F31 F26	2	0	0	2	2	0	0	2	0	2	0	2	0	0	0	0	1.03	1.05
F32 F26	3	2	3	2	3	2	3	2	3	2	2	2	3	2	3	3	0.51	0.26
F33 F26	4	3	3	4	4	3	3	4	3	4	3	3	4	4	4	3	0.52	0.27
F34 F26	3	2	3	2	3	2	3	2	3	2	2	3	3	2	3	3	0.52	0.27
F35 F26	4	2	2	4	4	2	4	2	2	4	2	2	4	2	4	2	1.03	1.05
F28 F27	3	2	2	3	3	2	2	3	2	3	2	3	2	2	2	2	0.51	0.26
F29 F27	4	3	4	3	4	3	4	3	4	3	3	3	4	3	4	3	0.51	0.26
F31 F27	4	3	4	3	4	3	4	3	3	4	4	4	4	3	4	4	0.51	0.26
F32 F27	4	3	3	4	4	3	3	4	3	4	3	4	3	3	3	3	0.51	0.26
F33 F27	4	3	4	3	4	3	4	3	4	3	3	3	4	3	4	4	0.51	0.26
F34 F27	4	2	2	4	4	2	2	4	2	4	2	2	4	4	4	2	1.04	1.08
F35 F27	3	1	3	1	3	1	3	1	3	1	1	3	3	1	3	3	1.04	1.08
F29 F28	4	3	4	3	4	3	4	3	4	3	3	4	4	4	4	4	0.51	0.26
F31 F28	3	2	3	2	3	2	3	2	3	2	2	2	3	2	3	3	0.51	0.26
F32 F28	4	3	3	4	4	3	4	3	3	4	4	3	4	3	4	3	0.52	0.27
F33 F28	3	2	3	2	3	2	3	2	2	3	3	3	3	2	3	2	0.51	0.26
F34 F28	4	3	3	4	4	3	3	4	3	4	3	4	3	3	3	4	0.51	0.26
F35 F28	3	2	3	2	3	2	3	2	3	2	2	2	3	2	3	3	0.51	0.26
F31 F29	3	2	2	3	3	2	2	3	2	3	2	2	2	3	2	2	0.51	0.26
F32 F29	3	2	3	2	3	2	3	2	3	2	2	3	3	3	3	3	0.51	0.26

Table F1 Continued

	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	R16	Standard Deviation	Square of Standard Deviation
F33 F29	4	3	3	4	4	3	3	4	3	4	3	4	3	3	3	3	0.51	0.26
F34 F29	4	3	4	3	4	3	4	3	4	3	3	3	4	3	4	4	0.51	0.26
F35 F29	3	2	2	3	3	2	3	2	2	3	3	2	3	2	3	2	0.52	0.27
F32 F31	3	1	1	3	3	1	3	1	1	3	3	1	3	1	3	1	1.04	1.08
F33 F31	3	2	3	2	3	2	3	2	2	3	3	3	3	2	3	2	0.51	0.26
F34 F31	4	3	3	4	4	3	3	4	3	4	3	4	3	3	3	3	0.51	0.26
F35 F31	3	2	3	2	3	2	3	2	3	2	2	2	3	2	3	2	0.51	0.26
F33 F32	4	2	4	2	4	2	4	2	2	4	2	4	2	2	2	2	1.03	1.05
F34 F32	4	2	2	4	4	2	2	4	2	4	2	2	2	4	2	2	1.03	1.05
F35 F32	3	2	3	2	3	2	3	2	3	2	2	3	3	3	3	3	0.51	0.26
F34 F33	2	1	2	1	2	1	2	1	1	2	2	2	2	1	2	2	0.51	0.26
F35 F33	2	1	1	2	2	1	1	2	1	2	1	2	1	1	1	1	0.51	0.26
F35 F34	3	1	1	3	3	1	3	1	1	3	1	1	3	1	3	1	1.03	1.05

APPENDIX G

ANALYSIS OF SELECTED FACTORS USING DEMATEL

Table G1 Average matrix (Z) for all selected factors

	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12	F13	F14	F15	F16	F19	F20	F21	F22	F23	F24
F1	0.0	2.6	2.8	3.5	3.5	3.6	3.4	2.4	2.0	2.6	3.0	2.4	2.4	1.6	2.4	2.5	1.4	1.4	2.6	3.1	1.4	2.4
F2	3.6	0.0	2.4	2.4	2.6	3.3	2.8	3.0	3.5	3.6	3.4	2.4	2.4	3.6	3.4	3.5	3.4	1.5	2.5	3.0	2.4	3.4
F3	3.5	0.6	0.0	3.4	2.5	3.5	2.6	2.4	1.4	2.6	3.6	0.9	2.4	1.4	1.6	2.8	1.6	1.4	2.5	3.5	1.6	1.4
F4	2.9	1.8	1.6	0.0	2.6	2.4	0.5	3.5	2.6	1.4	2.0	1.5	1.5	3.4	2.4	2.4	3.5	0.5	2.3	3.4	3.4	0.5
F5	3.3	0.3	0.4	0.6	0.0	3.4	3.4	1.6	2.8	1.4	1.5	2.6	0.4	0.5	0.5	0.6	2.4	1.6	2.4	1.9	2.6	2.6
F6	3.6	2.5	2.4	1.5	2.4	0.0	1.5	3.5	3.4	3.4	1.4	2.6	2.4	2.0	2.5	2.6	2.5	2.6	3.5	3.4	3.4	3.3
F7	2.4	0.4	0.5	0.4	0.4	0.6	0.0	0.5	2.6	2.4	1.5	2.5	2.6	0.4	0.4	0.4	0.4	0.6	2.6	1.4	0.5	3.5
F8	2.9	0.5	2.8	3.3	2.6	3.5	1.3	0.0	2.4	2.4	1.6	1.4	1.5	3.5	3.3	1.8	2.6	2.5	2.9	3.4	3.3	2.4
F9	3.6	1.9	0.4	3.6	3.6	3.6	1.6	3.3	0.0	3.6	3.4	2.5	2.5	3.6	3.4	3.4	3.4	1.4	3.6	3.6	3.4	3.5
F10	1.5	3.6	1.6	3.4	3.4	3.3	1.4	3.4	3.6	0.0	2.4	2.4	2.4	3.6	3.4	3.0	2.4	1.4	3.5	3.6	3.5	3.4
F11	3.3	3.3	1.5	0.5	3.3	2.8	3.4	1.6	2.4	1.6	0.0	3.4	1.4	1.5	0.6	1.4	0.6	1.4	1.4	2.4	1.6	2.4
F12	3.3	3.3	0.6	1.6	3.6	2.6	2.6	3.5	2.4	3.3	2.6	0.0	2.6	2.4	2.5	2.5	1.4	1.4	3.6	3.4	2.5	2.5
F13	1.4	3.4	2.4	2.5	2.4	3.0	2.6	3.4	2.6	2.8	2.4	2.6	0.0	3.4	3.6	3.6	3.4	2.6	3.4	3.4	3.5	3.6
F14	1.6	3.6	2.4	3.6	1.9	2.4	1.6	3.3	3.6	3.1	0.3	0.4	1.4	0.0	3.5	1.6	3.4	2.6	2.4	3.5	2.5	3.6
F15	1.6	3.5	1.3	2.6	2.6	2.3	1.3	3.1	3.6	1.5	1.6	0.5	1.6	3.6	0.0	1.5	3.4	1.4	3.6	3.4	3.5	0.5
F16	2.4	3.4	1.6	1.4	0.6	1.6	1.4	2.4	3.3	0.4	1.4	0.6	1.5	3.6	2.6	0.0	3.6	1.9	0.4	1.4	3.6	0.4
F19	2.4	0.4	1.6	3.4	1.4	1.6	0.4	3.5	3.6	0.4	0.6	0.3	0.4	3.4	1.3	2.6	0.0	0.4	1.4	2.4	3.1	1.4
F20	1.4	0.5	1.4	3.3	2.6	1.5	1.3	1.6	2.4	1.4	0.6	1.8	2.6	0.6	3.4	3.3	3.3	0.0	0.6	3.4	2.5	1.5
F21	1.6	1.3	3.4	3.6	3.6	3.6	1.5	3.3	1.6	1.6	1.3	0.6	2.6	3.5	1.6	2.3	3.3	2.6	0.0	3.4	3.4	0.6
F22	1.5	1.5	3.6	3.4	3.4	3.3	0.4	3.4	3.5	3.5	1.9	2.5	2.8	3.4	3.1	2.4	2.9	1.4	3.3	0.0	2.5	2.3
F23	2.6	1.6	0.6	0.9	3.3	1.4	0.5	2.6	1.4	2.6	1.6	1.4	1.6	2.3	3.4	3.6	3.6	1.5	1.4	1.3	0.0	0.5
F24	0.4	0.3	2.6	3.6	3.5	3.3	2.6	2.6	3.0	2.3	3.1	2.3	2.6	3.6	2.4	3.6	3.6	0.6	3.6	3.1	3.6	0.0
F25	1.4	0.4	2.6	2.5	3.4	2.6	0.6	2.4	2.6	2.4	1.4	1.6	2.4	3.4	2.5	2.4	3.4	1.5	3.6	2.4	2.6	1.6
F26	1.6	0.6	0.4	2.6	3.5	2.4	0.6	2.4	2.6	0.6	1.3	1.4	2.4	1.5	1.4	1.3	1.6	1.6	3.4	1.4	2.3	0.4
F27	2.6	1.0	2.6	2.3	3.6	2.4	1.3	2.5	2.6	1.6	1.5	1.4	2.6	3.6	1.3	2.5	2.5	2.3	3.4	3.6	3.3	3.6
F28	2.4	2.4	2.6	3.4	2.6	2.5	2.4	3.4	2.3	3.4	1.4	3.6	3.6	3.5	3.6	2.4	3.4	2.4	3.5	3.6	3.4	3.5
F29	1.6	2.3	2.4	3.6	2.6	3.4	2.6	3.4	3.4	0.0	2.5	3.5	3.6	3.6	3.5	2.5	2.5	3.1	3.4	3.6	3.3	1.4
F31	3.4	3.4	3.0	2.4	2.4	2.6	3.4	2.5	3.5	3.4	2.6	2.3	2.4	1.4	1.4	3.6	2.6	1.4	2.3	2.4	1.4	2.6
F32	1.4	2.4	0.4	1.4	2.6	1.5	1.3	1.6	3.4	1.4	2.6	1.8	3.6	2.6	2.8	2.6	3.6	2.3	1.5	2.1	3.3	2.4
F33	3.6	3.6	1.5	2.5	2.5	3.1	2.6	3.4	3.3	2.6	2.3	2.3	3.6	2.5	3.6	3.3	3.3	3.1	3.6	3.6	3.6	2.4
F34	2.6	2.0	0.6	3.4	2.4	2.4	1.4	3.4	3.6	3.5	2.8	1.6	2.4	3.4	3.6	3.4	3.4	2.4	3.4	3.4	3.4	2.6
F35	2.3	1.6	0.6	3.4	2.3	2.4	2.5	3.3	3.4	2.6	3.3	1.4	2.3	3.3	3.4	3.6	3.6	1.4	3.4	3.3	3.5	3.0

Table G1 Continued

	F25	F26	F27	F28	F29	F31	F32	F33	F34	F35
F1	3.4	3.6	2.4	1.4	3.5	3.4	2.5	2.0	1.6	1.4
F2	3.4	3.6	2.4	3.5	3.5	3.4	2.9	3.5	2.6	2.5
F3	3.4	2.4	3.6	1.4	2.4	3.3	2.4	2.5	2.5	2.6
F4	2.6	1.5	2.4	0.4	3.3	2.5	0.5	2.1	1.4	3.4
F5	3.4	2.5	3.0	2.6	2.4	2.8	2.6	2.4	3.5	3.5
F6	3.4	3.5	3.5	3.6	3.4	3.6	3.6	3.4	3.4	2.4
F7	2.6	2.4	2.4	1.4	1.6	3.5	2.5	2.6	2.4	3.5
F8	3.5	3.5	3.6	3.4	3.4	3.1	2.4	2.4	3.4	3.6
F9	3.5	3.1	3.4	3.4	3.4	3.4	3.5	3.5	3.6	3.4
F10	2.8	2.3	1.4	3.5	3.5	2.4	2.4	1.6	2.6	2.4
F11	2.4	2.6	3.6	2.4	2.5	3.6	2.4	2.4	2.4	2.6
F12	3.6	3.4	3.4	3.5	3.6	3.4	2.4	3.6	2.4	2.5
F13	3.4	3.5	3.5	3.6	3.4	3.4	3.6	3.4	3.4	3.6
F14	3.4	3.5	3.5	3.5	3.4	2.4	3.6	3.4	3.5	3.5
F15	2.6	1.4	2.4	2.1	2.1	1.8	3.4	3.6	2.4	1.4
F16	0.9	1.1	1.6	0.4	0.5	1.6	2.4	3.4	1.8	1.6
F19	3.4	3.6	3.6	1.4	1.5	1.1	1.4	3.4	3.4	1.6
F20	1.5	2.4	2.4	2.4	3.3	3.5	3.5	3.3	3.4	2.9
F21	3.4	3.5	3.5	3.6	3.4	2.1	3.6	2.9	3.4	0.8
F22	2.4	2.5	2.5	3.6	3.4	2.4	3.6	2.4	2.4	2.6
F23	3.6	3.4	3.4	1.4	2.6	3.0	3.5	3.6	3.4	3.5
F24	3.4	2.8	3.6	1.4	2.5	2.3	3.4	3.4	3.5	3.6
F25	0.0	2.6	2.4	2.0	2.5	3.4	2.9	3.6	3.6	2.9
F26	3.6	0.0	1.4	0.4	1.0	0.8	2.5	3.5	2.6	2.9
F27	3.6	3.6	0.0	2.4	3.4	3.6	3.4	3.5	3.0	2.1
F28	3.4	3.4	3.6	0.0	3.6	2.5	3.5	2.6	3.4	2.5
F29	3.4	3.3	3.4	3.6	0.0	2.4	2.6	3.4	3.5	2.5
F31	2.4	3.4	3.0	2.4	1.4	0.0	2.0	2.6	3.4	2.4
F32	2.4	2.4	3.4	2.3	2.1	2.8	0.0	2.8	2.8	2.6
F33	2.6	3.6	3.5	2.6	3.5	3.5	3.4	0.0	1.6	1.4
F34	3.5	3.6	3.6	1.9	3.4	2.4	2.4	3.1	0.0	1.9
F35	3.6	3.6	3.6	2.0	3.3	2.4	2.6	2.8	3.6	0.0

Table G2 Direct-relation Matrix (D) for all selected factors

	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
F1	0.00	0.03	0.03	0.04	0.04	0.04	0.03	0.03	0.02	0.03
F2	0.04	0.00	0.02	0.03	0.03	0.03	0.03	0.03	0.04	0.04
F3	0.04	0.01	0.00	0.04	0.03	0.04	0.03	0.02	0.01	0.03
F4	0.03	0.02	0.02	0.00	0.03	0.02	0.01	0.04	0.03	0.01
F5	0.03	0.00	0.00	0.01	0.00	0.03	0.03	0.02	0.03	0.01
F6	0.04	0.03	0.02	0.02	0.02	0.00	0.02	0.04	0.04	0.04
F7	0.03	0.00	0.01	0.00	0.00	0.01	0.00	0.01	0.03	0.02
F8	0.03	0.01	0.03	0.03	0.03	0.04	0.01	0.00	0.03	0.02
F9	0.04	0.02	0.00	0.04	0.04	0.04	0.02	0.03	0.00	0.04
F10	0.02	0.04	0.02	0.04	0.03	0.03	0.01	0.03	0.04	0.00
F11	0.03	0.03	0.02	0.01	0.03	0.03	0.04	0.02	0.02	0.02
F12	0.03	0.03	0.01	0.02	0.04	0.03	0.03	0.04	0.03	0.03
F13	0.01	0.03	0.02	0.03	0.02	0.03	0.03	0.04	0.03	0.03
F14	0.02	0.04	0.02	0.04	0.02	0.03	0.02	0.03	0.04	0.03
F15	0.02	0.04	0.01	0.03	0.03	0.02	0.01	0.03	0.04	0.02
F16	0.02	0.03	0.02	0.01	0.01	0.02	0.01	0.03	0.03	0.00
F19	0.02	0.00	0.02	0.04	0.01	0.02	0.00	0.04	0.04	0.00
F20	0.01	0.01	0.01	0.03	0.03	0.02	0.01	0.02	0.02	0.01
F21	0.02	0.01	0.04	0.04	0.04	0.04	0.02	0.03	0.02	0.02
F22	0.02	0.02	0.04	0.04	0.03	0.03	0.00	0.03	0.04	0.04
F23	0.03	0.02	0.01	0.01	0.03	0.01	0.01	0.03	0.01	0.03
F24	0.00	0.00	0.03	0.04	0.04	0.03	0.03	0.03	0.03	0.02
F25	0.01	0.00	0.03	0.03	0.03	0.03	0.01	0.02	0.03	0.02
F26	0.02	0.01	0.00	0.03	0.04	0.02	0.01	0.02	0.03	0.01
F27	0.03	0.01	0.03	0.02	0.04	0.02	0.01	0.03	0.03	0.02
F28	0.02	0.03	0.03	0.03	0.03	0.03	0.02	0.03	0.02	0.03
F29	0.02	0.02	0.02	0.04	0.03	0.03	0.03	0.04	0.03	0.00
F31	0.03	0.04	0.03	0.02	0.02	0.03	0.03	0.03	0.04	0.03
F32	0.01	0.03	0.00	0.01	0.03	0.02	0.01	0.02	0.03	0.01
F33	0.04	0.04	0.02	0.03	0.03	0.03	0.03	0.03	0.03	0.03
F34	0.03	0.02	0.01	0.03	0.02	0.02	0.01	0.03	0.04	0.04
F35	0.02	0.02	0.01	0.04	0.02	0.02	0.03	0.03	0.04	0.03

Table G2 Continued

F35	F34	F33	F32	F31	F29	F28	F27	F26	F25	F24	F23	F22	F21	F20	F19	F16	F15	F14	F13	F12	F11	
0.01	0.02	0.02	0.03	0.03	0.04	0.01	0.02	0.04	0.03	0.02	0.01	0.03	0.03	0.01	0.01	0.03	0.03	0.02	0.02	0.03	0.03	F1
0.03	0.03	0.04	0.03	0.03	0.04	0.04	0.02	0.04	0.03	0.04	0.03	0.03	0.03	0.02	0.04	0.04	0.03	0.04	0.02	0.02	0.04	F2
0.03	0.03	0.03	0.02	0.03	0.03	0.01	0.04	0.02	0.03	0.01	0.02	0.04	0.03	0.01	0.02	0.03	0.02	0.01	0.02	0.01	0.04	F3
0.04	0.01	0.02	0.01	0.03	0.03	0.00	0.03	0.02	0.03	0.01	0.04	0.03	0.02	0.01	0.04	0.02	0.03	0.04	0.02	0.02	0.02	F4
0.04	0.04	0.02	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.00	0.03	0.02	F5
0.02	0.03	0.04	0.04	0.04	0.03	0.04	0.04	0.04	0.04	0.03	0.03	0.04	0.04	0.03	0.03	0.03	0.03	0.02	0.02	0.03	0.01	F6
0.04	0.03	0.03	0.03	0.04	0.02	0.01	0.02	0.03	0.03	0.04	0.01	0.01	0.03	0.01	0.00	0.00	0.00	0.00	0.03	0.03	0.02	F7
0.04	0.03	0.02	0.03	0.03	0.04	0.03	0.04	0.04	0.04	0.03	0.03	0.03	0.03	0.03	0.03	0.02	0.03	0.04	0.02	0.01	0.02	F8
0.04	0.04	0.04	0.04	0.03	0.03	0.03	0.04	0.03	0.04	0.04	0.03	0.04	0.04	0.01	0.03	0.03	0.04	0.04	0.03	0.03	0.03	F9
0.03	0.03	0.02	0.03	0.02	0.04	0.04	0.01	0.02	0.03	0.04	0.04	0.04	0.04	0.01	0.02	0.03	0.03	0.04	0.02	0.03	0.03	F10
0.03	0.02	0.02	0.03	0.04	0.03	0.02	0.04	0.03	0.03	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.03	0.00	F11
0.03	0.03	0.04	0.02	0.04	0.04	0.04	0.04	0.03	0.04	0.03	0.03	0.03	0.04	0.01	0.01	0.03	0.03	0.03	0.03	0.00	0.03	F12
0.04	0.04	0.03	0.04	0.03	0.04	0.04	0.04	0.04	0.03	0.04	0.04	0.04	0.03	0.03	0.03	0.04	0.04	0.04	0.00	0.03	0.02	F13
0.04	0.04	0.03	0.04	0.02	0.04	0.04	0.04	0.04	0.04	0.04	0.03	0.04	0.02	0.03	0.03	0.02	0.04	0.00	0.01	0.00	0.00	F14
0.01	0.02	0.04	0.03	0.02	0.02	0.02	0.03	0.01	0.03	0.01	0.04	0.04	0.04	0.01	0.04	0.02	0.00	0.04	0.02	0.01	0.02	F15
0.02	0.02	0.03	0.03	0.02	0.01	0.00	0.02	0.01	0.01	0.00	0.04	0.01	0.00	0.02	0.04	0.00	0.03	0.04	0.02	0.01	0.01	F16
0.02	0.03	0.03	0.01	0.01	0.02	0.01	0.04	0.04	0.04	0.01	0.03	0.02	0.01	0.00	0.00	0.03	0.01	0.03	0.00	0.00	0.01	F19
0.03	0.03	0.03	0.04	0.04	0.03	0.02	0.03	0.03	0.02	0.02	0.03	0.04	0.01	0.00	0.03	0.03	0.03	0.01	0.03	0.02	0.01	F20
0.01	0.03	0.03	0.04	0.02	0.03	0.04	0.04	0.04	0.04	0.01	0.03	0.04	0.00	0.03	0.03	0.02	0.02	0.04	0.03	0.01	0.01	F21
0.03	0.03	0.02	0.04	0.02	0.04	0.04	0.03	0.03	0.02	0.02	0.03	0.00	0.03	0.01	0.03	0.03	0.03	0.03	0.03	0.03	0.02	F22
0.04	0.04	0.04	0.04	0.03	0.03	0.01	0.03	0.04	0.04	0.01	0.00	0.01	0.01	0.02	0.04	0.04	0.03	0.02	0.02	0.01	0.02	F23
0.04	0.04	0.04	0.03	0.02	0.03	0.01	0.04	0.03	0.04	0.00	0.04	0.03	0.04	0.01	0.04	0.04	0.02	0.04	0.03	0.02	0.03	F24
0.03	0.04	0.04	0.03	0.03	0.03	0.02	0.03	0.03	0.00	0.02	0.03	0.02	0.04	0.02	0.03	0.02	0.03	0.04	0.02	0.02	0.01	F25
0.03	0.03	0.04	0.03	0.01	0.01	0.00	0.01	0.00	0.04	0.00	0.02	0.01	0.03	0.02	0.02	0.01	0.01	0.02	0.03	0.01	0.01	**F26**
0.02	0.03	0.04	0.03	0.04	0.04	0.02	0.00	0.04	0.04	0.04	0.03	0.04	0.03	0.02	0.03	0.03	0.01	0.04	0.03	0.01	0.02	**F27**
0.03	0.04	0.03	0.04	0.03	0.04	0.00	0.04	0.03	0.03	0.04	0.03	0.04	0.04	0.02	0.03	0.02	0.04	0.04	0.04	0.04	0.01	**F28**
0.03	0.04	0.03	0.03	0.02	0.00	0.04	0.03	0.03	0.03	0.01	0.03	0.04	0.03	0.03	0.03	0.03	0.04	0.04	0.04	0.04	0.03	**F29**
0.03	0.03	0.03	0.02	0.00	0.01	0.02	0.03	0.03	0.02	0.03	0.01	0.03	0.02	0.01	0.03	0.04	0.01	0.01	0.03	0.02	0.03	**F31**
0.03	0.03	0.03	0.00	0.03	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.02	0.02	0.02	0.04	0.03	0.03	0.03	0.04	0.02	0.03	**F32**
0.01	0.02	0.00	0.03	0.04	0.04	0.03	0.04	0.04	0.03	0.03	0.04	0.04	0.04	0.03	0.03	0.03	0.04	0.03	0.04	0.02	0.02	**F33**
0.02	0.00	0.03	0.02	0.02	0.04	0.02	0.04	0.04	0.04	0.03	0.04	0.03	0.03	0.03	0.03	0.03	0.04	0.04	0.02	0.02	0.03	**F34**
0.00	0.04	0.03	0.03	0.03	0.03	0.02	0.04	0.04	0.04	0.03	0.04	0.03	0.03	0.01	0.04	0.04	0.03	0.03	0.02	0.01	0.03	**F35**

Table G3 Total relation matrix (T) for all selected factors

F29	F28	F27	F26	F25	F24	F23	F22	F21	F20	F19	F16	F15	F14	F13	F12	F11	F10	F9	F8	F7	F6	F5	F4	F3	F2	F1	
0.15	0.12	0.15	0.16	0.16	0.12	0.14	0.15	0.14	0.09	0.13	0.13	0.13	0.13	0.12	0.10	0.12	0.12	0.14	0.14	0.11	0.15	0.15	0.14	0.10	0.11	0.10	**F1**
0.18	0.16	0.18	0.19	0.19	0.15	0.17	0.18	0.17	0.11	0.18	0.16	0.16	0.18	0.14	0.12	0.14	0.15	0.18	0.17	0.12	0.17	0.16	0.16	0.11	0.10	0.16	**F2**
0.14	0.11	0.15	0.14	0.15	0.10	0.13	0.15	0.13	0.09	0.13	0.13	0.12	0.12	0.11	0.08	0.12	0.11	0.13	0.14	0.10	0.14	0.13	0.14	0.07	0.08	0.13	**F3**
0.13	0.09	0.13	0.12	0.14	0.09	0.14	0.14	0.12	0.07	0.14	0.12	0.12	0.14	0.10	0.08	0.09	0.10	0.13	0.14	0.07	0.12	0.13	0.10	0.08	0.09	0.12	**F4**
0.13	0.11	0.14	0.13	0.14	0.11	0.13	0.12	0.12	0.08	0.12	0.10	0.10	0.10	0.09	0.09	0.09	0.10	0.13	0.12	0.10	0.13	0.10	0.10	0.07	0.07	0.12	**F5**
0.17	0.15	0.18	0.18	0.19	0.14	0.18	0.18	0.17	0.12	0.17	0.15	0.15	0.16	0.14	0.12	0.11	0.15	0.18	0.17	0.10	0.13	0.16	0.15	0.11	0.12	0.15	**F6**
0.10	0.08	0.11	0.11	0.12	0.10	0.09	0.10	0.11	0.06	0.09	0.08	0.08	0.09	0.09	0.08	0.08	0.09	0.11	0.09	0.05	0.08	0.08	0.08	0.06	0.06	0.09	**F7**
0.16	0.14	0.17	0.17	0.18	0.13	0.16	0.17	0.16	0.11	0.16	0.13	0.15	0.16	0.12	0.10	0.11	0.13	0.16	0.13	0.09	0.16	0.15	0.15	0.11	0.09	0.14	**F8**
0.18	0.16	0.19	0.19	0.20	0.15	0.19	0.19	0.18	0.11	0.18	0.17	0.17	0.18	0.15	0.12	0.14	0.15	0.15	0.18	0.11	0.18	0.18	0.17	0.10	0.12	0.16	**F9**
0.17	0.15	0.16	0.16	0.17	0.14	0.17	0.17	0.16	0.10	0.16	0.15	0.15	0.17	0.13	0.11	0.12	0.11	0.17	0.17	0.10	0.16	0.16	0.16	0.10	0.13	0.13	**F10**
0.13	0.11	0.15	0.14	0.14	0.11	0.12	0.13	0.12	0.08	0.11	0.11	0.10	0.12	0.10	0.11	0.08	0.10	0.13	0.12	0.10	0.13	0.14	0.10	0.08	0.11	0.12	**F11**
0.17	0.15	0.18	0.17	0.18	0.13	0.16	0.17	0.17	0.10	0.15	0.15	0.15	0.16	0.13	0.09	0.12	0.14	0.16	0.17	0.11	0.15	0.16	0.14	0.09	0.13	0.15	**F12**
0.18	0.16	0.19	0.19	0.19	0.15	0.19	0.19	0.18	0.12	0.18	0.17	0.17	0.18	0.12	0.12	0.13	0.15	0.18	0.18	0.12	0.17	0.17	0.16	0.12	0.14	0.14	**F13**
0.17	0.15	0.18	0.18	0.18	0.14	0.16	0.17	0.16	0.11	0.17	0.14	0.16	0.13	0.12	0.09	0.10	0.14	0.17	0.17	0.10	0.15	0.15	0.16	0.11	0.13	0.13	**F14**
0.13	0.12	0.14	0.13	0.15	0.09	0.15	0.15	0.14	0.09	0.15	0.12	0.10	0.15	0.11	0.08	0.09	0.10	0.15	0.14	0.08	0.13	0.13	0.13	0.08	0.11	0.11	**F15**
0.09	0.08	0.11	0.10	0.10	0.07	0.12	0.10	0.09	0.07	0.12	0.08	0.10	0.12	0.08	0.06	0.07	0.07	0.12	0.11	0.07	0.09	0.09	0.09	0.07	0.09	0.10	**F16**
0.11	0.09	0.14	0.13	0.14	0.09	0.13	0.12	0.11	0.06	0.09	0.11	0.10	0.13	0.08	0.06	0.07	0.08	0.13	0.13	0.06	0.10	0.10	0.12	0.07	0.07	0.10	**F19**
0.14	0.11	0.14	0.14	0.13	0.10	0.13	0.14	0.11	0.07	0.14	0.13	0.13	0.11	0.11	0.09	0.08	0.10	0.13	0.12	0.08	0.11	0.13	0.13	0.08	0.08	0.10	**F20**
0.16	0.14	0.17	0.16	0.17	0.10	0.16	0.16	0.12	0.11	0.16	0.13	0.13	0.16	0.12	0.09	0.10	0.11	0.14	0.16	0.09	0.15	0.15	0.15	0.11	0.10	0.12	**F21**
0.16	0.15	0.16	0.16	0.16	0.12	0.16	0.14	0.16	0.10	0.16	0.14	0.15	0.16	0.13	0.11	0.11	0.14	0.17	0.16	0.09	0.16	0.16	0.16	0.12	0.11	0.12	**F22**
0.13	0.10	0.15	0.15	0.15	0.09	0.11	0.13	0.12	0.09	0.14	0.13	0.13	0.13	0.10	0.09	0.09	0.11	0.13	0.13	0.07	0.12	0.14	0.11	0.07	0.09	0.12	**F23**
0.16	0.12	0.18	0.17	0.18	0.10	0.17	0.17	0.16	0.09	0.17	0.15	0.14	0.16	0.13	0.11	0.12	0.13	0.16	0.16	0.11	0.16	0.16	0.16	0.11	0.09	0.11	**F24**
0.14	0.12	0.15	0.15	0.13	0.11	0.15	0.14	0.15	0.09	0.15	0.13	0.13	0.15	0.12	0.09	0.10	0.12	0.15	0.14	0.08	0.14	0.15	0.13	0.10	0.08	0.11	**F25**
0.10	0.08	0.11	0.09	0.13	0.07	0.11	0.10	0.12	0.07	0.10	0.09	0.09	0.10	0.09	0.07	0.08	0.08	0.11	0.11	0.06	0.11	0.12	0.11	0.06	0.07	0.09	**F26**
0.16	0.13	0.14	0.17	0.17	0.14	0.16	0.17	0.16	0.11	0.15	0.14	0.13	0.16	0.13	0.10	0.11	0.12	0.16	0.15	0.09	0.14	0.16	0.14	0.11	0.10	0.13	**F27**
0.18	0.12	0.19	0.19	0.19	0.15	0.18	0.18	0.18	0.12	0.18	0.15	0.17	0.18	0.15	0.13	0.12	0.15	0.17	0.18	0.11	0.16	0.16	0.17	0.12	0.12	0.14	**F28**
0.14	0.15	0.18	0.18	0.18	0.12	0.17	0.18	0.17	0.12	0.16	0.15	0.16	0.17	0.15	0.13	0.12	0.11	0.17	0.17	0.11	0.16	0.16	0.16	0.11	0.12	0.13	**F29**
0.13	0.13	0.16	0.16	0.16	0.12	0.14	0.15	0.14	0.09	0.15	0.15	0.12	0.13	0.12	0.10	0.11	0.13	0.16	0.15	0.11	0.14	0.14	0.14	0.11	0.12	0.14	**F31**
0.13	0.12	0.15	0.14	0.15	0.11	0.15	0.14	0.12	0.10	0.15	0.13	0.13	0.14	0.13	0.09	0.11	0.10	0.15	0.13	0.08	0.12	0.13	0.12	0.07	0.10	0.11	**F32**
0.17	0.14	0.18	0.18	0.18	0.13	0.18	0.18	0.17	0.12	0.17	0.16	0.16	0.16	0.15	0.12	0.12	0.14	0.18	0.17	0.11	0.16	0.16	0.15	0.10	0.13	0.15	**F33**
0.17	0.13	0.18	0.18	0.18	0.13	0.17	0.17	0.16	0.11	0.17	0.15	0.16	0.17	0.13	0.10	0.12	0.14	0.17	0.17	0.10	0.15	0.15	0.16	0.09	0.11	0.14	**F34**
0.17	0.13	0.18	0.18	0.18	0.13	0.17	0.17	0.16	0.10	0.17	0.16	0.15	0.16	0.13	0.10	0.13	0.13	0.17	0.17	0.11	0.15	0.15	0.16	0.09	0.11	0.13	**F35**

Table G3 Continued

F35	F34	F33	F32	F31	
0.12	0.14	0.15	0.14	0.15	**F1**
0.16	0.17	0.19	0.17	0.17	**F2**
0.13	0.14	0.14	0.14	0.14	**F3**
0.13	0.12	0.13	0.11	0.12	**F4**
0.13	0.14	0.13	0.13	0.13	**F5**
0.15	0.18	0.18	0.18	0.17	**F6**
0.11	0.11	0.11	0.11	0.11	**F7**
0.15	0.17	0.16	0.15	0.16	**F8**
0.17	0.19	0.19	0.18	0.18	**F9**
0.15	0.16	0.16	0.16	0.15	**F10**
0.12	0.13	0.14	0.13	0.14	**F11**
0.15	0.16	0.18	0.16	0.16	**F12**
0.17	0.19	0.19	0.18	0.18	**F13**
0.16	0.17	0.18	0.17	0.15	**F14**
0.12	0.14	0.15	0.15	0.12	**F15**
0.09	0.10	0.12	0.11	0.10	**F16**
0.10	0.13	0.13	0.11	0.10	**F19**
0.13	0.14	0.15	0.14	0.14	**F20**
0.12	0.16	0.16	0.16	0.14	**F21**
0.14	0.16	0.16	0.17	0.15	**F22**
0.13	0.15	0.15	0.14	0.13	**F23**
0.16	0.17	0.17	0.17	0.15	**F24**
0.13	0.16	0.16	0.15	0.15	**F25**
0.11	0.12	0.13	0.11	0.09	**F26**
0.14	0.16	0.17	0.16	0.16	**F27**
0.16	0.18	0.18	0.18	0.16	**F28**
0.15	0.18	0.18	0.17	0.16	**F29**
0.14	0.16	0.15	0.14	0.12	**F31**
0.13	0.14	0.15	0.11	0.14	**F32**
0.14	0.16	0.15	0.17	0.17	**F33**
0.14	0.14	0.17	0.16	0.15	**F34**
0.12	0.17	0.17	0.16	0.15	**F35**

Table G4 Matrix for overall cause and effect diagram for all selected factors

F20	F19	F16	F15	F14	F13	F12	F11	F10	F9	F8	F7	F6	F5	F4	F3	F2	F1	
0.09	0.13	0.13	0.13	0.13	0.12	0.10	0.12	0.12	0.14	0.14	0.11	0.15	0.15	0.14	0.10	0.11	0.10	**F1**
0.11	0.18	0.16	0.16	0.18	0.14	0.12	0.14	0.15	**0.18**	0.17	0.12	0.17	0.16	0.16	0.11	0.10	0.16	**F2**
0.09	0.13	0.13	0.12	0.12	0.11	0.08	0.12	0.11	0.13	0.14	0.10	0.14	0.13	0.14	0.07	0.08	0.13	**F3**
0.07	0.14	0.12	0.12	0.14	0.10	0.08	0.09	0.10	0.13	0.14	0.07	0.12	0.13	0.10	0.08	0.09	0.12	**F4**
0.08	0.12	0.10	0.10	0.10	0.09	0.09	0.09	0.10	0.13	0.12	0.10	0.13	0.10	0.10	0.07	0.07	0.12	**F5**
0.12	0.17	0.15	0.15	0.16	0.14	0.12	0.11	0.15	0.18	0.17	0.10	0.13	0.16	0.15	0.11	0.12	0.15	**F6**
0.06	0.09	0.08	0.08	0.09	0.09	0.08	0.08	0.09	0.11	0.09	0.05	0.08	0.08	0.08	0.06	0.06	0.09	**F7**
0.11	0.16	0.13	0.15	0.16	0.12	0.10	0.11	0.13	0.16	0.13	0.09	0.16	0.15	0.15	0.11	0.09	0.14	**F8**
0.11	**0.18**	0.17	0.17	**0.18**	0.15	0.12	0.14	0.15	0.15	**0.18**	0.11	0.18	0.18	0.17	0.10	0.12	0.16	**F9**
0.10	0.16	0.15	0.15	0.17	0.13	0.11	0.12	0.11	0.17	0.17	0.10	0.16	0.16	0.16	0.10	0.13	0.13	**F10**
0.08	0.11	0.11	0.10	0.12	0.10	0.11	0.08	0.10	0.13	0.12	0.10	0.13	0.14	0.10	0.08	0.11	0.12	**F11**
0.10	0.15	0.15	0.15	0.16	0.13	0.09	0.12	0.14	0.16	0.17	0.11	0.15	0.16	0.14	0.09	0.13	0.15	**F12**
0.12	**0.18**	0.17	0.17	**0.18**	0.12	0.12	0.13	0.15	0.18	**0.18**	0.12	0.17	0.17	0.16	0.12	0.14	0.14	**F13**
0.11	0.17	0.14	0.16	0.13	0.12	0.09	0.10	0.14	0.17	0.17	0.10	0.15	0.15	0.16	0.11	0.13	0.13	**F14**
0.09	0.15	0.12	0.10	0.15	0.11	0.08	0.09	0.10	0.15	0.14	0.08	0.13	0.13	0.13	0.08	0.11	0.11	**F15**
0.07	0.12	0.08	0.10	0.12	0.08	0.06	0.07	0.07	0.12	0.11	0.07	0.09	0.09	0.09	0.07	0.09	0.10	**F16**
0.06	0.09	0.11	0.10	0.13	0.08	0.06	0.07	0.08	0.13	0.13	0.06	0.10	0.10	0.12	0.07	0.07	0.10	**F19**
0.07	0.14	0.13	0.13	0.11	0.11	0.09	0.08	0.10	0.13	0.12	0.08	0.11	0.13	0.13	0.08	0.08	0.10	**F20**
0.11	0.16	0.13	0.13	0.16	0.12	0.09	0.10	0.11	0.14	0.16	0.09	0.15	0.15	0.15	0.11	0.10	0.12	**F21**
0.10	0.16	0.14	0.15	0.16	0.13	0.11	0.11	0.14	0.17	0.16	0.09	0.16	0.16	0.16	0.12	0.11	0.12	**F22**
0.09	0.14	0.13	0.13	0.13	0.10	0.09	0.09	0.11	0.13	0.13	0.07	0.12	0.14	0.11	0.07	0.09	0.12	**F23**
0.09	0.17	0.15	0.14	0.16	0.13	0.11	0.12	0.13	0.16	0.16	0.11	0.16	0.16	0.16	0.11	0.09	0.11	**F24**
0.09	0.15	0.13	0.13	0.15	0.12	0.09	0.10	0.12	0.15	0.14	0.08	0.14	0.15	0.13	0.10	0.08	0.11	**F25**
0.07	0.10	0.09	0.09	0.10	0.09	0.07	0.08	0.08	0.11	0.11	0.06	0.11	0.12	0.11	0.06	0.07	0.09	**F26**
0.11	0.15	0.14	0.13	0.16	0.13	0.10	0.11	0.12	0.16	0.15	0.09	0.14	0.16	0.14	0.11	0.10	0.13	**F27**
0.12	0.18	0.15	0.17	0.18	0.15	0.13	0.12	0.15	0.17	0.18	0.11	0.16	0.16	0.17	0.12	0.12	0.14	**F28**
0.12	0.16	0.15	0.16	0.17	0.15	0.13	0.12	0.11	0.17	0.17	0.11	0.16	0.16	0.16	0.11	0.12	0.13	**F29**
0.09	0.15	0.15	0.12	0.13	0.12	0.10	0.11	0.13	0.16	0.15	0.11	0.14	0.14	0.14	0.11	0.12	0.14	**F31**
0.10	0.15	0.13	0.13	0.14	0.13	0.09	0.11	0.10	0.15	0.13	0.08	0.12	0.13	0.12	0.07	0.10	0.11	**F32**
0.12	0.17	0.16	0.16	0.16	0.15	0.12	0.12	0.14	0.18	0.17	0.11	0.16	0.16	0.15	0.10	0.13	0.15	**F33**
0.11	0.17	0.15	0.16	0.17	0.13	0.10	0.12	0.14	0.17	0.17	0.10	0.15	0.15	0.16	0.09	0.11	0.14	**F34**
0.10	0.17	0.16	0.15	0.16	0.13	0.10	0.13	0.13	0.17	0.17	0.11	0.15	0.15	0.16	0.09	0.11	0.13	**F35**

Table G4 Continued

	F21	F22	F23	F24	F25	F26	F27	F28	F29	F31	F32	F33	F34	F35
F1	0.14	0.15	0.14	0.12	0.16	0.16	0.15	0.12	0.15	0.15	0.14	0.15	0.14	0.12
F2	0.17	0.18	0.17	0.15	**0.19**	**0.19**	0.18	0.16	0.18	0.17	0.17	**0.19**	0.17	0.16
F3	0.13	0.15	0.13	0.10	0.15	0.14	0.15	0.11	0.14	0.14	0.14	0.14	0.14	0.13
F4	0.12	0.14	0.14	0.09	0.14	0.12	0.13	0.09	0.13	0.12	0.11	0.13	0.12	0.13
F5	0.12	0.12	0.13	0.11	0.14	0.13	0.14	0.11	0.13	0.13	0.13	0.13	0.14	0.13
F6	0.17	0.18	0.18	0.14	**0.19**	**0.18**	**0.18**	0.15	0.17	0.17	0.18	**0.18**	0.18	0.15
F7	0.11	0.10	0.09	0.10	0.12	0.11	0.11	0.08	0.10	0.11	0.11	0.11	0.11	0.11
F8	0.16	0.17	0.16	0.13	0.18	0.17	0.17	0.14	0.16	0.16	0.15	0.16	0.17	0.15
F9	**0.18**	**0.19**	**0.19**	0.15	**0.20**	**0.19**	**0.19**	0.16	**0.18**	0.18	**0.18**	**0.19**	**0.19**	0.17
F10	0.16	0.17	0.17	0.14	0.17	0.16	0.16	0.15	0.17	0.15	0.16	0.16	0.16	0.15
F11	0.12	0.13	0.12	0.11	0.14	0.14	0.15	0.11	0.13	0.14	0.13	0.14	0.13	0.12
F12	0.17	0.17	0.16	0.13	**0.18**	0.17	0.18	0.15	0.17	0.16	0.16	0.18	0.16	0.15
F13	0.18	**0.19**	**0.19**	0.15	**0.19**	**0.19**	**0.19**	0.16	**0.18**	0.18	**0.18**	**0.19**	**0.19**	0.17
F14	0.16	0.17	0.16	0.14	0.18	0.18	0.18	0.15	0.17	0.15	0.17	0.18	0.17	0.16
F15	0.14	0.15	0.15	0.09	0.15	0.13	0.14	0.12	0.13	0.12	0.15	0.15	0.14	0.12
F16	0.09	0.10	0.12	0.07	0.10	0.10	0.11	0.08	0.09	0.10	0.11	0.12	0.10	0.09
F19	0.11	0.12	0.13	0.09	0.14	0.13	0.14	0.09	0.11	0.10	0.11	0.13	0.13	0.10
F20	0.11	0.14	0.13	0.10	0.13	0.14	0.14	0.11	0.14	0.14	0.14	0.15	0.14	0.13
F21	0.12	0.16	0.16	0.10	0.17	0.16	0.17	0.14	0.16	0.14	0.16	0.16	0.16	0.12
F22	0.16	0.14	0.16	0.12	0.16	0.16	0.16	0.15	0.16	0.15	0.17	0.16	0.16	0.14
F23	0.12	0.13	0.11	0.09	0.15	0.15	0.15	0.10	0.13	0.13	0.14	0.15	0.15	0.13
F24	0.16	0.17	0.17	0.10	0.18	0.17	0.18	0.12	0.16	0.15	0.17	0.17	0.17	0.16
F25	0.15	0.14	0.15	0.11	0.13	0.15	0.15	0.12	0.14	0.15	0.15	0.16	0.16	0.13
F26	0.12	0.10	0.11	0.07	0.13	0.09	0.11	0.08	0.10	0.09	0.11	0.13	0.12	0.11
F27	0.16	0.17	0.16	0.14	0.17	0.17	0.14	0.13	0.16	0.16	0.16	0.17	0.16	0.14
F28	0.18	**0.18**	**0.18**	0.15	**0.19**	**0.19**	**0.19**	0.12	0.18	0.16	0.18	0.18	**0.18**	0.16
F29	0.17	0.18	0.17	0.12	**0.18**	0.18	**0.18**	0.15	0.14	0.16	0.17	**0.18**	0.18	0.15
F31	0.14	0.15	0.14	0.12	0.16	0.16	0.16	0.13	0.13	0.12	0.14	0.15	0.16	0.14
F32	0.12	0.14	0.15	0.11	0.15	0.14	0.15	0.12	0.13	0.14	0.11	0.15	0.14	0.13
F33	0.17	**0.18**	0.18	0.13	0.18	**0.18**	**0.18**	0.14	0.17	0.17	0.17	0.15	0.16	0.14
F34	0.16	0.17	0.17	0.13	0.18	0.18	0.18	0.13	0.17	0.15	0.16	0.17	0.14	0.14
F35	0.16	0.17	0.17	0.13	0.18	0.18	0.18	0.13	0.17	0.15	0.16	0.17	0.17	0.12

APPENDIX H

ELEMENT WISE FACTORS' ANALYSIS USING DEMATEL

Table H1 Average Matrix for Element 2

	F4	F8	F14	F19	F21	F27
F4	0.00	3.31	3.56	3.44	3.56	2.31
F8	3.50	0.00	3.31	3.50	3.31	2.50
F14	3.44	3.50	0.00	3.38	3.50	3.63
F19	3.50	2.56	3.38	0.00	3.31	2.50
F21	2.25	2.88	2.38	1.38	0.00	3.38
F27	2.44	3.56	3.50	3.63	3.50	0.00

Table H2 D Matrix for Element 1

	F4	F8	F14	F19	F21	F27
F4	0.00	0.19	0.20	0.20	0.20	0.13
F8	0.20	0.00	0.19	0.20	0.19	0.14
F14	0.20	0.20	0.00	0.19	0.20	0.21
F19	0.20	0.15	0.19	0.00	0.19	0.14
F21	0.13	0.16	0.14	0.08	0.00	0.19
F27	0.14	0.20	0.20	0.21	0.20	0.00

Table H3 T Matrix for Element 1

	F4	F8	F14	F19	F21	F27	r	c	r+c	r-c
F4	1.29	1.50	1.52	1.45	1.61	1.35	8.72	8.26	16.98	0.47
F8	1.45	1.33	1.51	1.46	1.59	1.36	8.71	8.57	17.28	0.14
F14	1.54	1.60	1.45	1.54	1.70	1.49	9.32	8.69	18.01	0.64
F19	1.39	1.40	1.45	1.23	1.53	1.30	8.31	8.28	16.59	0.03
F21	1.13	1.20	1.19	1.10	1.14	1.14	6.92	9.21	16.13	-2.29
F27	1.44	1.54	1.55	1.50	1.64	1.27	8.94	7.92	16.86	1.02

Table H4 Average Matrix for Element 2

	F3	F4	F5	F6	F11	F14	F16	F19	F21	F22	F25	F28	F29	F33	F34
F3	0.00	1.56	0.38	2.38	1.56	2.38	1.56	1.56	3.44	3.56	2.63	2.56	2.38	1.56	0.63
F4	3.44	0.00	0.63	1.50	0.50	3.56	1.38	3.44	3.56	3.44	2.50	3.38	3.63	2.50	3.38
F5	2.50	2.63	0.00	2.38	3.31	1.88	0.56	1.44	3.56	3.38	3.38	2.56	2.63	2.50	2.38

Table H4 Continued

	F3	F4	F5	F6	F11	F14	F16	F19	F21	F22	F25	F28	F29	F33	F34
F6	3.50	2.38	3.38	0.00	2.75	2.44	1.56	1.63	3.63	3.31	2.56	2.50	3.38	3.13	2.38
F11	3.56	2.00	1.50	1.38	0.00	0.31	1.38	0.56	1.31	1.88	1.38	1.38	2.50	2.31	2.75
F14	1.38	3.44	0.50	2.00	1.50	0.00	3.56	3.38	3.50	3.38	3.44	3.50	3.56	2.50	3.44
F16	2.75	2.38	0.56	2.63	1.38	1.56	0.00	2.56	2.31	2.44	2.38	2.38	2.50	3.31	3.38
F19	1.63	3.50	2.38	2.50	0.56	3.38	3.56	0.00	3.31	2.88	3.38	3.38	2.50	3.31	3.38
F21	2.50	2.25	2.38	3.50	1.38	2.38	0.38	1.38	0.00	3.31	3.56	3.50	3.38	3.56	3.38
F22	3.50	3.38	1.88	3.44	2.38	3.50	1.38	2.38	3.44	0.00	2.38	3.56	3.63	3.56	3.38
F25	3.38	2.56	3.38	3.44	2.44	3.44	0.88	3.44	3.44	2.38	0.00	3.38	3.38	2.63	3.50
F28	1.38	0.38	2.56	3.56	2.38	3.50	0.38	1.38	3.56	3.56	2.00	0.00	3.63	2.56	1.88
F29	2.44	3.25	2.44	3.38	2.50	3.44	0.50	1.50	3.38	3.44	2.50	3.63	0.00	3.50	3.44
F33	2.50	2.13	2.38	3.44	2.38	3.38	3.38	3.38	2.88	2.38	3.56	2.56	3.38	0.00	3.13
F34	2.50	1.38	3.50	3.38	2.38	3.50	1.75	3.38	3.38	2.44	3.56	3.44	3.50	1.63	0.00

Table H5 D Matrix for Element 2

	F3	F4	F5	F6	F11	F14	F16	F19	F21	F22	F25	F28	F29	F33	F34
F3	0.00	0.03	0.01	0.05	0.03	0.05	0.03	0.03	0.08	0.08	0.06	0.06	0.05	0.03	0.01
F4	0.08	0.00	0.01	0.03	0.01	0.08	0.03	0.08	0.08	0.08	0.06	0.08	0.08	0.06	0.08
F5	0.06	0.06	0.00	0.05	0.07	0.04	0.01	0.03	0.08	0.08	0.08	0.06	0.06	0.06	0.05

Table H5 Continued

	F6	F11	F14	F16	F19	F21	F22	F25	F28	F29	F33	F34
F3	0.08	0.08	0.03	0.06	0.04	0.06	0.08	0.08	0.03	0.05	0.06	0.06
F4	0.05	0.04	0.08	0.05	0.08	0.05	0.08	0.06	0.01	0.07	0.05	0.03
F5	0.08	0.03	0.01	0.01	0.05	0.05	0.04	0.08	0.06	0.05	0.05	0.08
F6	0.00	0.03	0.04	0.06	0.06	0.08	0.08	0.08	0.08	0.08	0.08	0.08
F11	0.06	0.00	0.03	0.03	0.01	0.03	0.05	0.05	0.05	0.06	0.05	0.05
F14	0.05	0.01	0.00	0.03	0.08	0.05	0.08	0.08	0.08	0.08	0.08	0.08
F16	0.03	0.03	0.08	0.00	0.08	0.01	0.03	0.02	0.01	0.01	0.08	0.04
F19	0.04	0.01	0.08	0.06	0.00	0.03	0.05	0.08	0.03	0.03	0.08	0.08
F21	0.08	0.03	0.08	0.05	0.07	0.00	0.08	0.08	0.08	0.08	0.06	0.08
F22	0.07	0.04	0.08	0.05	0.06	0.07	0.00	0.05	0.08	0.08	0.05	0.05
F25	0.06	0.03	0.08	0.05	0.08	0.08	0.05	0.00	0.04	0.06	0.08	0.08
F28	0.06	0.03	0.08	0.05	0.08	0.08	0.08	0.08	0.00	0.08	0.06	0.08
F29	0.08	0.06	0.08	0.06	0.06	0.08	0.08	0.08	0.08	0.00	0.08	0.08
F33	0.07	0.05	0.06	0.07	0.07	0.08	0.08	0.06	0.06	0.08	0.00	0.04
F34	0.05	0.06	0.08	0.08	0.08	0.08	0.08	0.08	0.04	0.08	0.07	0.00

Table H6 T Matrix for Element 2

	F3	F4	F5	F6	F11
F3	0.20	0.33	0.30	0.34	0.25
F4	0.22	0.24	0.28	0.29	0.20
F5	0.17	0.22	0.20	0.28	0.17
F6	0.27	0.32	0.32	0.29	0.21
F11	0.19	0.21	0.26	0.27	0.13
F14	0.27	0.36	0.31	0.34	0.19
F16	0.15	0.19	0.16	0.20	0.13
F19	0.21	0.30	0.24	0.27	0.16
F21	0.32	**0.40**	0.37	**0.40**	0.24
F22	0.30	0.37	0.35	0.38	0.23
F25	0.27	0.34	0.33	0.34	0.21
F28	0.29	0.38	0.34	0.36	0.23
F29	0.29	**0.39**	0.35	**0.39**	0.26
F33	0.25	0.33	0.31	0.35	0.23
F34	0.24	0.36	0.32	0.34	0.24
r	3.63	4.75	4.45	4.85	3.08
c	4.64	4.21	3.69	5.02	3.55
r+c	8.27	8.96	8.13	**9.86**	6.63
r-c	-1.01	0.55	0.76	-0.17	-0.47

Table H6 Continued

	F34	F33	F29	F28	F25	F22	F21	F19	F16	F14
F3	0.33	0.34	0.33	0.26	0.36	0.36	0.32	0.32	0.29	0.31
F4	0.28	0.31	0.32	0.22	0.32	0.33	0.29	0.33	0.26	0.32
F5	0.30	0.28	0.27	0.24	0.30	0.27	0.26	0.28	0.20	0.24
F6	0.37	**0.38**	0.37	0.33	**0.39**	**0.39**	0.36	0.36	0.31	0.35
F11	0.27	0.27	0.27	0.23	0.28	0.27	0.23	0.23	0.21	0.24
F14	0.37	**0.38**	0.37	0.33	**0.39**	**0.39**	0.34	0.38	0.29	0.30
F16	0.21	0.25	0.18	0.15	0.20	0.21	0.17	0.25	0.14	0.24
F19	0.31	0.32	0.27	0.23	0.32	0.30	0.26	0.25	0.26	0.31
F21	**0.41**	**0.41**	**0.41**	0.36	**0.43**	**0.43**	0.32	**0.42**	0.33	**0.41**
F22	0.37	0.38	**0.39**	0.34	**0.38**	0.33	0.37	**0.38**	0.32	**0.39**
F25	0.37	**0.38**	0.35	0.29	0.31	0.36	0.36	0.38	0.30	0.37
F28	**0.39**	**0.38**	**0.39**	0.27	**0.41**	**0.41**	0.38	**0.40**	0.32	**0.39**
F29	**0.41**	**0.41**	0.34	0.36	**0.42**	**0.43**	**0.39**	**0.39**	0.33	**0.41**
F33	0.33	0.30	0.36	0.30	0.36	**0.38**	0.35	0.37	0.31	0.35
F34	0.30	0.38	0.37	0.30	**0.39**	**0.39**	0.36	**0.38**	0.32	0.38
r	5.03	5.17	5.00	4.22	5.25	5.27	4.75	5.10	4.19	5.02
c	5.08	4.87	5.58	5.33	4.98	5.29	5.67	4.02	2.82	5.01
r+c	**10.11**	**10.04**	**10.58**	**9.55**	**10.23**	**10.56**	**10.41**	9.11	7.01	**10.03**
r-c	-0.05	0.30	-0.58	-1.11	0.28	-0.02	-0.92	1.08	1.36	0.01

Table H7 Average Matrix for Element 3

	F19	F16	F14	F10	F9	F4	F1
F1	1.38	2.50	1.63	2.56	2.00	3.50	0.00
F4	3.50	2.38	3.44	1.44	2.56	0.00	2.88
F9	3.38	3.38	3.56	3.63	0.00	3.56	3.63
F10	2.38	3.00	3.63	0.00	3.56	3.44	1.50
F14	3.38	1.56	0.00	3.13	3.56	3.56	1.63
F16	3.56	0.00	3.56	0.44	3.31	1.38	2.38
F19	0.00	2.56	3.38	0.44	3.56	3.44	2.38
F21	3.31	2.31	3.50	1.63	1.63	3.56	1.63
F22	2.88	2.44	3.38	3.50	3.50	3.44	1.50
F23	3.56	3.56	2.31	2.63	1.38	0.88	2.56
F25	3.38	2.38	3.44	2.38	2.63	2.50	1.38
F28	3.38	2.38	3.50	3.38	2.31	3.38	2.38
F29	2.50	2.50	3.56	0.00	3.38	3.63	1.63
F33	3.31	3.31	2.50	2.63	3.31	2.50	3.56
F34	3.38	3.38	3.44	3.50	3.56	3.38	2.56
F35	3.63	3.63	3.31	2.56	3.44	3.44	2.25

Table H7 Continued

	F1	F4	F9	F10	F14	F16	F19	F21	F22	F23	F25	F28	F29	F33	F34	F35
F21	2.56	2.25	3.56	3.50	2.38	0.38	1.38	0.00	3.31	1.38	3.56	3.50	3.38	3.56	3.38	3.38
F22	3.13	3.38	3.63	3.56	3.50	1.38	2.38	3.44	0.00	1.31	2.38	3.56	3.63	3.56	3.38	3.31
F23	1.44	3.44	3.38	3.50	2.50	3.56	3.13	3.38	2.50	0.00	2.56	3.38	3.25	3.56	3.44	3.50
F25	3.38	2.56	3.50	2.75	3.44	0.88	3.44	3.44	2.38	3.56	0.00	3.38	3.38	2.63	3.50	3.56
F28	1.44	0.38	3.38	3.50	3.50	0.38	1.38	3.56	3.56	1.38	2.00	0.00	3.63	2.56	1.88	2.00
F29	3.50	3.25	3.38	3.50	3.44	0.50	1.50	3.38	3.44	2.63	2.50	3.63	0.00	3.50	3.44	3.31
F33	2.00	2.13	3.50	1.56	3.38	3.38	3.38	2.88	2.38	3.56	3.56	2.56	3.38	0.00	3.13	2.75
F34	1.56	1.38	3.56	2.56	3.50	1.75	3.38	3.38	2.44	3.44	3.56	3.44	3.50	1.63	0.00	3.63
F35	1.44	3.44	3.44	2.44	3.50	1.63	1.63	0.75	2.56	3.50	2.88	2.50	2.50	1.38	1.88	0.00

Table H8 D Matrix for Element 3

	F1	F4	F9	F10	F14	F16	F19	F21	F22	F23	F25	F28	F29	F33	F34	F35
F1	0.00	0.05	0.07	0.03	0.03	0.05	0.05	0.03	0.03	0.05	0.03	0.05	0.03	0.07	0.05	0.04
F4	0.07	0.00	0.07	0.07	0.07	0.03	0.07	0.07	0.07	0.02	0.05	0.06	0.07	0.05	0.06	0.07
F9	0.04	0.05	0.00	0.07	0.07	0.06	0.07	0.03	0.07	0.03	0.05	0.04	0.06	0.06	0.07	0.07
F10	0.05	0.03	0.07	0.00	0.06	0.01	0.01	0.03	0.07	0.05	0.05	0.06	0.00	0.05	0.07	0.05
F14	0.03	0.07	0.07	0.07	0.00	0.07	0.06	0.07	0.06	0.04	0.07	0.07	0.07	0.05	0.07	0.06
F16	0.05	0.05	0.06	0.06	0.03	0.00	0.05	0.04	0.05	0.07	0.05	0.05	0.05	0.06	0.06	0.07

Table H8 Continued

	F19	F21	F22	F23	F25	F28	F29	F33	F34	F35
F1	0.03	0.05	0.06	0.03	0.06	0.03	0.07	0.04	0.03	0.03
F4	0.07	0.04	0.06	0.07	0.05	0.01	0.06	0.04	0.03	0.07
F9	0.06	0.07	0.07	0.06	0.07	0.06	0.06	0.07	0.07	0.07
F10	0.05	0.07	0.07	0.07	0.05	0.07	0.07	0.03	0.05	0.05
F14	0.06	0.05	0.07	0.05	0.07	0.07	0.07	0.06	0.07	0.07
F16	0.07	0.01	0.03	0.07	0.02	0.01	0.01	0.06	0.03	0.03
F19	0.00	0.03	0.05	0.06	0.07	0.03	0.03	0.06	0.06	0.03
F21	0.06	0.00	0.07	0.06	0.07	0.07	0.06	0.05	0.06	0.01
F22	0.05	0.06	0.00	0.05	0.05	0.07	0.07	0.05	0.05	0.05
F23	0.07	0.03	0.03	0.00	0.07	0.03	0.05	0.07	0.07	0.07
F25	0.06	0.07	0.05	0.05	0.00	0.04	0.05	0.07	0.07	0.05
F28	0.06	0.07	0.07	0.06	0.06	0.00	0.07	0.05	0.07	0.05
F29	0.05	0.06	0.07	0.06	0.06	0.07	0.00	0.06	0.07	0.05
F33	0.06	0.07	0.07	0.07	0.05	0.05	0.07	0.00	0.03	0.03
F34	0.06	0.06	0.06	0.07	0.07	0.04	0.07	0.06	0.00	0.04
F35	0.07	0.06	0.06	0.07	0.07	0.04	0.06	0.05	0.07	0.00

Table H9 T Matrix for Element 3

	F1	F4	F9	F10	F14	F16	F19
F1	0.13	0.24	0.21	0.18	0.22	0.21	0.21
F4	0.20	0.20	0.24	0.18	0.27	0.23	0.27
F9	0.27	**0.34**	0.26	0.27	**0.35**	**0.31**	**0.34**
F10	0.21	0.30	0.29	0.18	**0.31**	0.27	0.29
F14	0.22	**0.31**	**0.30**	0.24	0.26	0.25	**0.32**
F16	0.16	0.18	0.21	0.12	0.22	0.14	0.22
F19	0.19	0.26	0.25	0.16	0.27	0.23	0.21
F21	0.20	0.28	0.24	0.19	0.29	0.24	0.29
F22	0.20	0.29	0.28	0.23	**0.30**	0.25	0.29
F23	0.20	0.21	0.22	0.19	0.25	0.24	0.27
F25	0.19	0.26	0.26	0.21	0.29	0.24	0.29
F28	0.23	**0.30**	0.28	0.24	**0.32**	0.27	**0.31**
F29	0.21	0.30	0.28	0.18	**0.31**	0.26	0.29
F33	0.23	0.27	0.28	0.22	0.28	0.26	0.29
F34	0.23	**0.31**	**0.30**	0.25	**0.32**	0.28	**0.32**
F35	0.23	**0.31**	**0.30**	0.23	**0.32**	0.29	**0.32**
r	3.30	4.35	4.22	3.27	4.62	3.97	4.53
c	3.29	3.69	5.00	4.30	4.49	2.77	3.61
r+c	6.59	8.04	9.21	7.57	9.10	6.74	8.14
r-c	0.01	0.66	-0.78	-1.02	0.13	1.20	0.91

Table H10 Average Matrix for Element 4

F14	F13	F12	F11	F10	F9	F5	F1	
1.63	2.38	2.44	3.00	2.56	2.00	3.50	0.00	**F1**
0.50	0.38	2.63	1.50	1.44	2.75	0.00	3.31	**F5**
3.56	2.50	2.50	3.38	3.63	0.00	3.56	3.63	**F9**
3.63	2.38	2.44	2.44	0.00	3.56	3.38	1.50	**F10**
1.50	1.44	3.38	0.00	1.56	2.38	3.31	3.25	**F11**
2.44	2.56	0.00	2.56	3.31	2.44	3.56	3.31	**F12**
3.44	0.00	2.56	2.38	2.75	2.56	2.38	1.38	**F13**
0.00	1.44	0.44	0.31	3.13	3.56	1.88	1.63	**F14**
3.63	1.63	0.50	1.56	1.50	3.63	2.56	1.56	**F15**
3.38	0.38	0.31	0.56	0.44	3.56	1.44	2.38	**F19**
0.63	2.63	1.75	0.63	1.44	2.38	2.56	1.44	**F20**
3.38	2.75	2.50	1.88	3.50	3.50	3.38	1.50	**F22**
2.31	1.63	1.44	1.56	2.63	1.38	3.31	2.56	**F23**
3.56	2.56	2.31	3.13	2.31	3.00	3.50	0.38	**F24**
3.44	2.38	1.56	1.38	2.38	2.63	3.38	1.38	**F25**
3.50	3.56	3.63	1.38	3.38	2.31	2.56	2.38	**F28**
3.56	3.63	3.50	2.50	0.00	3.38	2.63	1.63	**F29**
2.50	3.56	2.25	2.31	2.63	3.31	2.50	3.56	**F33**
3.44	2.38	1.56	2.75	3.50	3.56	2.38	2.56	**F34**

Table H9 Continued

F35	F34	F33	F29	F28	F25	F23	F22	F21	
0.17	0.20	0.21	0.24	0.17	0.24	0.21	0.24	0.21	**F1**
0.22	0.22	0.24	0.26	0.16	0.25	0.27	0.26	0.22	**F4**
0.28	**0.32**	**0.33**	**0.33**	0.27	**0.34**	**0.34**	**0.34**	**0.31**	**F9**
0.23	0.27	0.26	0.29	0.24	0.29	**0.30**	0.30	0.28	**F10**
0.26	0.30	0.30	**0.30**	0.25	**0.31**	0.30	**0.31**	0.27	**F14**
0.15	0.18	0.21	0.16	0.12	0.17	0.22	0.18	0.14	**F16**
0.19	0.25	0.25	0.22	0.18	0.26	0.26	0.24	0.20	**F19**
0.19	0.27	0.27	0.28	0.23	0.28	0.28	0.28	0.20	**F21**
0.23	0.26	0.27	0.29	0.24	0.27	0.28	0.23	0.27	**F22**
0.22	0.25	0.26	0.24	0.18	0.26	0.20	0.22	0.20	**F23**
0.23	0.27	0.28	0.26	0.21	0.22	0.27	0.26	0.26	**F25**
0.24	0.29	0.28	**0.31**	0.19	**0.31**	**0.31**	**0.31**	0.29	**F28**
0.23	0.28	0.29	0.23	0.24	0.29	0.30	0.30	0.27	**F29**
0.21	0.24	0.22	0.28	0.22	0.27	0.29	0.29	0.27	**F33**
0.23	0.23	0.30	**0.30**	0.22	**0.31**	**0.31**	**0.31**	0.28	**F34**
0.20	**0.30**	0.29	**0.30**	0.23	**0.31**	**0.32**	**0.31**	0.29	**F35**
3.48	4.13	4.24	4.28	3.36	4.39	4.46	4.34	3.97	**r**
4.56	4.51	4.14	4.25	4.48	3.99	3.61	4.21	4.02	**c**
8.04	8.64	8.38	8.53	7.84	8.39	8.07	8.55	7.98	**r+c**
-1.08	-0.38	0.10	0.04	-1.12	0.40	0.85	0.14	-0.05	**r-c**

Table H10 Continued

	F15	F19	F20	F22	F23	F24	F25	F28	F29	F33	F34
F1	2.44	1.38	1.44	3.13	1.44	2.38	3.38	1.44	3.50	2.00	1.56
F5	0.50	2.38	1.56	1.88	2.56	2.63	3.38	2.56	2.44	2.38	3.50
F9	3.44	3.38	1.44	3.63	3.38	3.50	3.50	3.38	3.38	3.50	3.56
F10	3.38	2.38	1.44	3.56	3.50	3.44	2.75	3.50	3.50	1.56	2.56
F11	0.63	0.56	1.44	2.38	1.56	2.38	2.44	2.38	2.50	2.38	2.38
F12	2.50	1.44	1.38	3.38	2.50	2.50	3.63	3.50	3.56	3.63	2.44
F13	3.56	3.38	2.63	3.44	3.50	3.63	3.38	3.56	3.44	3.38	3.44
F14	3.50	3.38	2.63	3.50	2.50	3.56	3.44	3.50	3.44	3.38	3.50
F15	0.00	3.44	1.38	3.44	3.50	0.50	2.56	2.13	2.13	3.63	2.38
F19	1.31	0.00	0.44	2.38	3.13	1.38	3.44	1.38	1.50	3.38	3.38
F20	3.38	3.25	0.00	3.44	2.50	1.50	1.50	2.38	3.25	3.25	3.38
F22	3.13	2.88	1.44	0.00	2.50	2.25	2.38	3.56	3.44	2.38	2.44
F23	3.38	3.56	1.50	1.31	0.00	0.50	3.56	1.38	2.63	3.56	3.44
F24	2.38	3.56	0.63	3.13	3.63	0.00	3.44	1.38	2.50	3.44	3.50
F25	2.50	3.38	1.50	2.38	2.56	1.63	0.00	2.00	2.50	3.56	3.56
F28	3.63	3.38	2.38	3.56	3.38	3.50	3.38	0.00	3.63	2.56	3.44
F29	3.50	2.50	3.13	3.63	3.25	1.44	3.38	3.63	0.00	3.38	3.50
F33	3.63	3.31	3.13	3.56	3.56	2.44	2.63	2.56	3.50	0.00	1.63
F34	3.56	3.38	2.44	3.38	3.44	2.63	3.50	1.88	3.44	3.13	0.00

Table H11 D Matrix for Element 4

	F1	F5	F9	F10	F11
F1	0.00	0.06	0.03	0.04	0.05
F5	0.06	0.00	0.05	0.02	0.03
F9	0.06	0.06	0.00	0.06	0.06
F10	0.03	0.06	0.06	0.00	0.04
F11	0.06	0.06	0.04	0.03	0.00
F12	0.06	0.06	0.04	0.06	0.04
F13	0.02	0.04	0.04	0.05	0.04
F14	0.03	0.03	0.06	0.05	0.01
F15	0.03	0.04	0.06	0.03	0.03
F19	0.04	0.02	0.06	0.01	0.01
F20	0.02	0.04	0.04	0.02	0.01
F22	0.03	0.06	0.06	0.06	0.03
F23	0.04	0.06	0.02	0.04	0.03
F24	0.01	0.06	0.05	0.04	0.05
F25	0.02	0.06	0.04	0.04	0.02
F28	0.04	0.04	0.04	0.06	0.02
F29	0.03	0.04	0.06	0.00	0.04
F33	0.06	0.04	0.06	0.04	0.04
F34	0.04	0.04	0.06	0.06	0.05

Table H11 Continued

	F1	**F5**	**F9**	**F10**	**F11**	**F12**	**F13**	**F14**	**F15**	**F19**	**F20**	**F22**	**F23**	**F24**	**F25**	**F28**	**F29**	**F33**	**F34**
F12	0.04	0.04	0.04	0.04	0.06	0.00	0.04	0.01	0.01	0.01	0.03	0.04	0.02	0.04	0.03	0.06	0.06	0.04	0.03
F13	0.04	0.01	0.04	0.04	0.02	0.04	0.00	0.02	0.03	0.01	0.04	0.05	0.03	0.04	0.04	0.06	0.06	0.06	0.04
F14	0.03	0.01	0.06	0.06	0.03	0.04	0.06	0.00	0.06	0.06	0.01	0.06	0.04	0.06	0.06	0.06	0.06	0.04	0.06
F15	0.04	0.01	0.06	0.06	0.01	0.04	0.06	0.06	0.00	0.02	0.06	0.05	0.06	0.04	0.04	0.06	0.06	0.06	0.06
F19	0.02	0.04	0.06	0.04	0.01	0.02	0.06	0.06	0.06	0.00	0.06	0.05	0.06	0.06	0.06	0.06	0.04	0.06	0.06
F20	0.02	0.03	0.02	0.02	0.02	0.02	0.04	0.04	0.02	0.01	0.00	0.02	0.03	0.01	0.03	0.04	0.05	0.05	0.04
F22	0.05	0.03	0.06	0.06	0.04	0.06	0.06	0.06	0.06	0.04	0.06	0.00	0.02	0.05	0.04	0.06	0.06	0.06	0.06
F23	0.02	0.04	0.06	0.06	0.03	0.04	0.06	0.04	0.06	0.05	0.04	0.04	0.00	0.06	0.04	0.06	0.06	0.06	0.06
F24	0.04	0.04	0.06	0.06	0.04	0.04	0.06	0.06	0.01	0.02	0.03	0.04	0.01	0.00	0.03	0.06	0.02	0.04	0.04
F25	0.06	0.06	0.06	0.05	0.04	0.06	0.06	0.06	0.04	0.06	0.03	0.04	0.06	0.06	0.00	0.06	0.06	0.04	0.06
F28	0.02	0.04	0.06	0.06	0.04	0.06	0.06	0.06	0.04	0.02	0.04	0.06	0.02	0.02	0.03	0.00	0.06	0.04	0.03
F29	0.06	0.04	0.06	0.06	0.04	0.06	0.06	0.06	0.04	0.03	0.06	0.06	0.04	0.04	0.04	0.06	0.00	0.06	0.06
F33	0.03	0.04	0.06	0.03	0.04	0.06	0.06	0.06	0.06	0.06	0.06	0.04	0.06	0.06	0.06	0.04	0.06	0.00	0.05
F34	0.03	0.06	0.06	0.04	0.04	0.04	0.06	0.06	0.04	0.06	0.06	0.04	0.06	0.06	0.06	0.06	0.06	0.03	0.00

Table H12 T Matrix for Element 4

	F1	**F5**	**F9**	**F10**	**F11**	**F12**	**F13**	**F14**	**F15**	**F19**	**F20**	**F22**	**F23**	**F24**	**F25**	**F28**	**F29**	**F33**	**F34**	**r**	**c**	**r+c**	**r-c**
F1	0.13	0.17	0.24	0.18	0.17	0.21	0.19	0.18	0.16	0.15	0.15	0.18	0.17	0.16	0.16	0.21	0.19	0.22	0.20	3.42	3.58	7.01	-0.16
F5	0.22	0.15	**0.29**	0.26	0.21	0.26	0.26	0.23	0.21	0.16	0.21	0.25	0.22	0.25	0.23	0.26	0.25	0.25	0.25	4.40	3.32	7.73	1.08

Table H12 Continued

	F9	F10	F11	F12	F13	F14	F15	F19	F20	F22	F23	F24	F25	F28	F29	F33	F34
F1	0.20	0.18	0.16	0.16	0.17	0.19	0.20	0.19	0.13	0.23	0.19	0.17	0.23	0.17	0.23	0.21	0.20
F5	0.20	0.15	0.13	0.16	0.13	0.16	0.16	0.19	0.12	0.19	0.20	0.17	0.22	0.18	0.20	0.20	0.22
F9	0.24	0.25	0.21	0.21	0.22	**0.29**	**0.28**	**0.29**	0.17	**0.30**	**0.29**	0.24	**0.31**	0.26	**0.30**	**0.30**	**0.30**
F10	0.26	0.17	0.18	0.19	0.20	0.26	0.26	0.24	0.15	**0.27**	0.27	0.22	0.27	0.24	0.27	0.24	0.26
F11	0.19	0.15	0.11	0.17	0.15	0.18	0.16	0.16	0.12	0.20	0.18	0.16	0.21	0.18	0.20	0.20	0.20
F12	0.25	0.22	0.18	0.15	0.20	0.24	0.24	0.23	0.15	0.27	0.25	0.21	**0.28**	0.24	**0.27**	**0.27**	0.25
F13	0.26	0.22	0.19	0.20	0.17	**0.27**	**0.27**	**0.28**	0.18	**0.29**	**0.28**	0.23	**0.29**	0.25	**0.28**	**0.29**	**0.28**
F14	0.26	0.21	0.14	0.15	0.18	0.20	0.25	0.26	0.17	0.27	0.24	0.22	0.27	0.23	0.26	0.26	0.26
F15	0.23	0.16	0.14	0.13	0.16	0.22	0.17	0.23	0.13	0.23	0.23	0.14	0.22	0.18	0.21	0.24	0.21
F19	0.20	0.12	0.11	0.11	0.12	0.19	0.16	0.14	0.10	0.19	0.19	0.14	0.21	0.15	0.17	0.20	0.20
F20	0.21	0.16	0.13	0.15	0.17	0.18	0.22	0.22	0.11	0.23	0.21	0.16	0.21	0.19	0.23	0.23	0.23
F22	0.26	0.22	0.17	0.18	0.20	0.25	0.24	0.25	0.15	0.21	0.24	0.20	0.25	0.23	0.26	0.25	0.25
F23	0.19	0.18	0.14	0.14	0.15	0.20	0.22	0.22	0.13	0.20	0.17	0.14	0.24	0.17	0.21	0.23	0.23
F24	0.25	0.20	0.18	0.18	0.19	0.25	0.23	0.25	0.13	0.25	0.26	0.16	0.26	0.20	0.24	0.26	0.26
F25	0.22	0.18	0.14	0.15	0.18	0.23	0.22	0.23	0.14	0.23	0.22	0.17	0.19	0.19	0.23	0.25	0.24
F28	0.26	0.24	0.18	0.22	0.23	**0.28**	**0.28**	**0.28**	0.18	**0.29**	**0.28**	0.23	**0.29**	0.20	**0.29**	**0.28**	**0.29**
F29	0.27	0.18	0.18	0.21	0.22	0.26	0.26	0.25	0.18	**0.28**	0.27	0.19	**0.28**	0.25	0.22	**0.28**	**0.27**
F33	0.26	0.21	0.18	0.19	0.22	0.25	0.26	0.26	0.18	**0.28**	**0.27**	0.21	0.27	0.23	**0.27**	0.22	0.24
F34	**0.27**	0.23	0.19	0.18	0.20	0.26	0.26	0.27	0.17	**0.28**	**0.27**	0.21	**0.28**	0.22	**0.27**	**0.27**	0.22
r	4.49	3.64	3.04	3.22	3.47	4.37	4.35	4.44	2.81	4.68	4.53	3.57	4.78	3.96	4.61	4.68	4.60
c	5.00	4.39	3.31	4.38	4.70	4.23	3.59	3.00	3.58	4.23	3.54	4.14	3.81	4.76	4.50	4.48	4.51
r+c	9.49	8.03	6.36	7.60	8.17	8.60	7.94	7.44	6.39	8.91	8.07	7.71	8.59	8.73	9.11	9.16	9.11
r-c	-0.51	-0.75	-0.27	-1.16	-1.23	0.14	0.75	1.44	-0.77	0.45	0.98	-0.57	0.97	-0.80	0.12	0.19	0.09

Table H13 Average Matrix for Element 5

	F4	F8	F10	F14	F21	F29	F34
F4	0.00	3.31	3.44	3.56	3.56	3.63	3.38
F8	3.50	0.00	3.38	3.31	3.31	3.44	3.38
F10	1.44	2.38	0.00	3.13	1.63	0.00	3.50
F14	3.44	3.50	3.63	0.00	3.50	3.56	3.44
F21	2.25	2.88	3.50	2.38	0.00	3.38	3.38
F29	3.25	3.44	3.50	3.44	3.38	0.00	3.44
F34	1.38	3.38	2.56	3.50	3.38	3.50	0.00

Table H14 D Matrix for Element 5

	F4	F8	F10	F14	F21	F29	F34
F4	0.00	0.16	0.16	0.17	0.17	0.17	0.16
F8	0.17	0.00	0.16	0.16	0.16	0.16	0.16
F10	0.07	0.11	0.00	0.15	0.08	0.00	0.17
F14	0.16	0.17	0.17	0.00	0.17	0.17	0.16
F21	0.11	0.14	0.17	0.11	0.00	0.16	0.16
F29	0.15	0.16	0.17	0.16	0.16	0.00	0.16
F34	0.07	0.16	0.12	0.17	0.16	0.17	0.00

Table H15 T Matrix for Element 5

	F4	**F8**	**F10**	**F14**	**F21**	**F29**	**F34**	**r**	**c**	**r+c**	**r-c**
F4	0.85	**1.17**	**1.23**	**1.20**	**1.17**	**1.11**	**1.25**	7.98	6.00	13.98	1.98
F8	0.97	1.01	**1.20**	**1.17**	**1.14**	**1.08**	**1.23**	7.79	7.29	15.08	0.50
F10	0.58	0.73	0.66	0.77	0.70	0.60	0.82	4.87	7.66	12.52	-2.79
F14	1.00	**1.18**	**1.24**	**1.06**	**1.17**	**1.11**	**1.26**	8.02	7.44	15.46	0.58
F21	0.82	1.01	**1.07**	1.01	0.88	0.96	**1.09**	6.83	7.22	14.06	-0.39
F29	0.97	**1.15**	**1.21**	**1.17**	**1.14**	0.94	**1.23**	7.82	6.77	14.59	1.04
F34	0.81	**1.04**	**1.05**	**1.06**	**1.03**	0.98	0.97	6.93	7.85	14.78	-0.92

Table H16 Average Matrix for Element 6

	F1	**F5**	**F11**	**F19**	**F23**	**F31**	**F34**
F1	0.00	3.31	3.25	2.38	1.38	3.38	2.56
F5	3.50	0.00	3.31	1.44	3.38	2.38	2.38
F11	3.00	1.50	0.00	0.56	1.38	2.56	2.75
F19	1.38	2.38	0.56	0.00	3.38	2.56	3.38
F23	3.38	3.38	2.44	3.44	0.00	2.38	3.50
F31	3.38	2.75	3.56	1.13	3.38	0.00	2.38
F34	1.56	3.50	2.38	3.38	3.56	3.38	0.00

Table H17 D Matrix for Element 6

	F1	**F5**	**F11**	**F19**	**F23**	**F31**	**F34**
F1	0.00	0.18	0.18	0.13	0.07	0.18	0.14
F5	0.19	0.00	0.18	0.08	0.18	0.13	0.13
F11	0.16	0.08	0.00	0.03	0.07	0.14	0.15
F19	0.07	0.13	0.03	0.00	0.18	0.14	0.18
F23	0.18	0.18	0.13	0.19	0.00	0.13	0.19
F31	0.18	0.15	0.19	0.06	0.18	0.00	0.13
F34	0.08	0.19	0.13	0.18	0.19	0.18	0.00

Table H18 T Matrix for Element 6

	F1	F5	F11	F19	F25	F31	F3	r	c	r+c	r+c
F1	0.80	**0.9**	**0.9**	0.7	0.87	**0.96**	**0.9**	6.19	6.33	12.52	-0.14
F5	**0.98**	0.8	**0.9**	0.7	**0.96**	**0.94**	**0.9**	6.32	6.50	12.82	-0.18
F11	0.75	0.7	0.6	0.5	0.68	0.74	0.7	4.74	6.16	10.90	-1.41
F19	0.79	0.8	0.7	0.5	**0.88**	0.85	**0.8**	5.57	4.91	10.48	0.66
F25	**1.06**	**1.0**	**1.0**	0.8	**0.91**	**1.04**	**1.0**	7.05	6.31	13.36	0.74
F31	**0.98**	**0.9**	**0.9**	0.7	**0.97**	0.83	**0.9**	6.38	6.41	12.79	-0.03
F34	**0.96**	**1.0**	**0.9**	0.8	**1.05**	**1.04**	**0.9**	6.82	6.45	13.28	0.37

Table H19 Average Matrix for Element 7

	F4	F5	F8	F10	F15	F22	F29	F31
F4	0.00	0.63	3.31	3.44	2.63	3.44	3.63	1.38
F5	2.63	0.00	2.63	3.38	2.56	3.38	2.63	2.63
F8	3.50	1.63	0.00	3.38	3.13	3.38	3.44	1.56
F10	1.44	1.44	2.38	0.00	1.50	3.50	0.00	1.44
F15	2.44	0.50	3.25	3.38	0.00	3.13	3.50	2.75
F22	3.38	1.88	3.38	3.56	3.44	0.00	3.63	2.13
F29	3.25	2.44	3.44	3.50	2.13	3.44	0.00	2.13
F31	0.50	2.63	2.44	2.44	3.38	3.56	2.63	0.00

Table H20 D Matrix for Element 7

	F4	F5	F8	F10	F15	F22	F29	F31
F4	0.00	0.03	0.14	0.14	0.11	0.14	0.15	0.06
F5	0.11	0.00	0.11	0.14	0.11	0.14	0.11	0.11
F8	0.15	0.07	0.00	0.14	0.13	0.14	0.14	0.07
F10	0.06	0.06	0.10	0.00	0.06	0.15	0.00	0.06
F15	0.10	0.02	0.14	0.14	0.00	0.13	0.15	0.12
F22	0.14	0.08	0.14	0.15	0.14	0.00	0.15	0.09
F29	0.14	0.10	0.14	0.15	0.09	0.14	0.00	0.09
F31	0.02	0.11	0.10	0.10	0.14	0.15	0.11	0.00

Table H21 T Matrix for Element 7

	F4	F5	F8	F10	F15	F22	F29	F32	r	c	r+c	r-c
F4	0.33	0.24	**0.51**	**0.55**	**0.44**	**0.55**	**0.49**	0.31	3.41	3.28	6.69	0.14
F5	**0.45**	0.23	**0.51**	**0.57**	**0.46**	**0.58**	**0.47**	0.38	3.64	2.13	5.77	1.50
F8	**0.48**	0.29	0.41	**0.58**	**0.48**	**0.58**	**0.51**	0.34	3.68	3.85	7.53	-0.17
F10	0.28	0.20	0.34	0.28	0.29	0.41	0.24	0.23	2.27	4.21	6.49	-1.94
F15	0.43	0.24	**0.51**	**0.55**	0.35	**0.55**	**0.49**	0.37	3.49	3.46	6.95	0.03
F22	**0.50**	0.31	**0.56**	**0.61**	**0.52**	**0.49**	**0.54**	0.38	3.89	4.30	8.20	-0.41
F29	**0.48**	0.32	**0.54**	**0.59**	**0.46**	**0.59**	0.38	0.36	3.73	3.56	7.28	0.17
F32	0.34	0.31	**0.46**	**0.50**	**0.46**	**0.54**	**0.44**	0.25	3.31	2.62	5.93	0.69

Table H22 Average Matrix for Element 8

	F1	**F2**	**F4**	**F5**	**F6**	**F8**	**F9**	**F10**	**F11**	**F14**	**F15**	**F21**	**F22**	**F25**	**F26**	**F28**	**F29**	**F33**	**F35**
F1	0.00	3.56	2.88	3.31	3.56	2.88	3.63	1.50	3.25	1.63	1.56	1.63	1.50	1.38	1.63	2.38	1.63	3.56	2.25
F2	2.63	0.00	1.75	0.31	2.50	0.50	1.88	3.56	3.25	3.63	3.50	1.25	1.50	0.38	0.56	2.44	2.31	3.63	1.63
F4	3.50	2.44	0.00	0.63	1.50	3.31	3.56	3.44	0.50	3.56	2.63	3.56	3.44	2.50	2.63	3.38	3.63	2.50	3.44
F5	3.50	2.56	2.63	0.00	2.38	2.63	3.56	3.38	3.31	1.88	2.56	3.56	3.38	3.38	3.50	2.56	2.63	2.50	2.31
F6	3.63	3.25	2.38	3.38	0.00	3.50	3.56	3.31	2.75	2.44	2.31	3.63	3.31	2.56	2.38	2.50	3.38	3.13	2.38
F8	2.44	3.00	3.50	1.63	3.50	0.00	3.31	3.38	1.56	3.31	3.13	3.31	3.38	2.38	2.38	3.38	3.44	3.38	3.25
F9	2.00	3.50	2.56	2.75	3.44	2.44	0.00	3.56	2.38	3.56	3.63	1.63	3.50	2.63	2.56	2.31	3.38	3.31	3.44
F10	2.56	3.56	1.44	1.44	3.44	2.38	3.63	0.00	1.56	3.13	1.50	1.63	3.50	2.38	0.63	3.38	0.00	2.63	2.56
F11	3.00	3.44	2.00	1.50	1.38	1.63	3.38	2.44	0.00	0.31	1.56	1.31	1.88	1.38	1.31	1.38	2.50	2.31	3.25
F14	1.63	3.63	3.44	0.50	2.00	3.50	3.56	3.63	1.50	0.00	3.63	3.50	3.38	3.44	1.50	3.50	3.56	2.50	3.31
F15	2.44	3.38	2.44	0.50	2.50	3.25	3.44	3.38	0.63	3.50	0.00	1.63	3.13	2.50	1.38	3.63	3.50	3.63	3.38
F21	2.56	2.50	2.25	2.38	3.50	2.88	3.56	3.50	1.38	2.38	3.63	0.00	3.31	3.56	3.38	3.50	3.38	3.56	3.38
F22	3.13	3.00	3.38	1.88	3.44	3.38	3.63	3.56	2.38	3.50	3.44	3.44	0.00	2.38	1.44	3.56	3.63	3.56	3.31
F25	3.38	3.38	2.56	3.38	3.44	3.50	3.50	2.75	2.44	3.44	2.56	3.44	2.38	0.00	3.63	3.38	3.38	2.63	3.56
F26	3.63	3.63	1.50	2.50	3.50	3.50	3.13	2.25	2.56	3.50	1.38	3.50	2.50	2.63	0.00	3.38	3.31	3.56	3.63
F28	1.44	3.50	0.38	2.56	3.56	3.38	3.38	3.50	2.38	3.50	2.13	3.56	3.56	2.00	0.44	0.00	3.63	2.56	2.00
F29	3.50	3.50	3.25	2.44	3.38	3.44	3.38	3.50	2.50	3.44	2.13	3.38	3.44	2.50	1.00	3.63	0.00	3.50	3.31
F33	2.00	3.50	2.13	2.38	3.44	2.38	3.50	1.56	2.38	3.38	3.63	2.88	2.38	3.56	3.50	2.56	3.38	0.00	2.75
F35	1.44	2.50	3.44	3.50	2.38	3.63	3.44	2.44	2.63	3.50	1.44	0.75	2.56	2.88	2.88	2.50	2.50	1.38	0.00

Table H23 D Matrix for Element 8

	F1	**F2**	**F4**	**F5**	**F6**	**F8**	**F9**	**F10**	**F11**	**F14**	**F15**	**F21**	**F22**	**F25**	**F26**	**F28**	**F29**	**F33**	**F35**
F1	0.00	0.06	0.05	0.05	0.06	0.05	0.06	0.02	0.05	0.03	0.03	0.03	0.02	0.02	0.03	0.04	0.03	0.06	0.04
F2	0.04	0.00	0.03	0.01	0.04	0.01	0.03	0.06	0.05	0.06	0.06	0.02	0.02	0.01	0.01	0.04	0.04	0.06	0.03
F4	0.06	0.04	0.00	0.01	0.02	0.05	0.06	0.06	0.01	0.06	0.04	0.06	0.06	0.04	0.04	0.06	0.06	0.04	0.06
F5	0.06	0.04	0.04	0.00	0.04	0.04	0.06	0.06	0.05	0.03	0.04	0.06	0.06	0.06	0.06	0.04	0.04	0.04	0.04
F6	0.06	0.05	0.04	0.06	0.00	0.06	0.06	0.05	0.05	0.04	0.04	0.06	0.05	0.04	0.04	0.04	0.06	0.05	0.04
F8	0.04	0.05	0.06	0.03	0.06	0.00	0.05	0.06	0.03	0.05	0.05	0.05	0.06	0.04	0.04	0.06	0.06	0.06	0.05
F9	0.03	0.06	0.04	0.05	0.06	0.04	0.00	0.06	0.04	0.06	0.06	0.03	0.06	0.04	0.04	0.04	0.06	0.05	0.06
F10	0.04	0.06	0.02	0.02	0.06	0.04	0.06	0.00	0.03	0.05	0.02	0.03	0.06	0.04	0.01	0.06	0.00	0.04	0.04
F11	0.05	0.06	0.03	0.02	0.02	0.03	0.06	0.04	0.00	0.01	0.03	0.02	0.03	0.02	0.02	0.02	0.04	0.04	0.05
F14	0.03	0.06	0.06	0.01	0.03	0.06	0.06	0.06	0.02	0.00	0.06	0.06	0.06	0.06	0.02	0.06	0.06	0.04	0.05
F15	0.04	0.06	0.04	0.01	0.04	0.05	0.06	0.06	0.01	0.06	0.00	0.03	0.05	0.04	0.02	0.06	0.06	0.06	0.06
F21	0.04	0.04	0.04	0.04	0.06	0.05	0.06	0.06	0.02	0.04	0.06	0.00	0.05	0.06	0.06	0.06	0.06	0.06	0.06
F22	0.05	0.05	0.06	0.03	0.06	0.06	0.06	0.06	0.04	0.06	0.06	0.06	0.00	0.04	0.02	0.06	0.06	0.06	0.05
F25	0.06	0.06	0.04	0.06	0.06	0.06	0.06	0.05	0.04	0.06	0.04	0.06	0.04	0.00	0.06	0.06	0.06	0.04	0.06
F26	0.06	0.06	0.02	0.04	0.06	0.06	0.05	0.04	0.04	0.06	0.02	0.06	0.04	0.04	0.00	0.06	0.05	0.06	0.06
F28	0.02	0.06	0.01	0.04	0.06	0.06	0.06	0.06	0.04	0.06	0.03	0.06	0.06	0.03	0.01	0.00	0.06	0.04	0.03
F29	0.06	0.06	0.05	0.04	0.06	0.06	0.06	0.06	0.04	0.06	0.03	0.06	0.06	0.04	0.02	0.06	0.00	0.06	0.05
F33	0.03	0.06	0.03	0.04	0.06	0.04	0.06	0.03	0.04	0.06	0.06	0.05	0.04	0.06	0.06	0.04	0.06	0.00	0.05
F35	0.02	0.04	0.06	0.06	0.04	0.06	0.06	0.04	0.04	0.06	0.02	0.01	0.04	0.05	0.05	0.04	0.04	0.02	0.00

Table H24 T Matrix for Element 8

	F1	**F2**	**F4**	**F5**	**F6**	**F8**	**F9**	**F10**	**F11**	**F14**	**F15**	**F21**	**F22**	**F25**	**F26**	**F28**	**F29**	**F33**	**F35**	**r**	**c**	**r+c**	**r-c**
F1	0.16	0.24	0.19	0.17	0.23	0.21	0.25	0.20	0.18	0.20	0.18	0.18	0.20	0.17	0.15	0.21	0.20	0.23	0.21	3.77	4.13	7.90	-0.36
F2	0.17	0.16	0.15	0.11	0.19	0.15	0.20	0.21	0.16	0.21	0.19	0.15	0.17	0.13	0.11	0.19	0.18	0.20	0.17	3.18	4.99	8.17	-1.82
F4	0.23	0.26	0.17	0.15	0.23	0.25	**0.29**	0.26	0.16	0.26	0.22	0.24	0.25	0.21	0.18	0.26	0.26	0.25	0.26	4.38	3.84	8.22	0.55
F5	0.24	0.27	0.22	0.15	0.25	0.24	**0.29**	0.27	0.21	0.24	0.23	0.24	0.26	0.23	0.20	0.25	0.25	0.25	0.24	4.52	3.24	7.75	1.28
F6	0.25	**0.28**	0.22	0.20	0.22	0.26	**0.30**	**0.27**	0.20	0.26	0.23	0.25	0.26	0.22	0.19	0.25	0.27	0.27	0.25	4.65	4.60	9.25	0.05
F8	0.23	**0.28**	0.23	0.18	**0.27**	0.21	**0.30**	**0.28**	0.19	**0.27**	0.24	0.24	0.27	0.22	0.19	0.27	0.27	**0.27**	0.26	4.66	4.49	9.15	0.18
F9	0.22	**0.28**	0.22	0.19	0.26	0.24	0.24	**0.27**	0.19	**0.27**	0.24	0.21	0.26	0.22	0.18	0.25	0.26	0.26	0.26	4.54	5.23	9.77	-0.68
F10	0.19	0.24	0.16	0.14	0.22	0.20	0.24	0.17	0.15	0.22	0.17	0.17	0.22	0.18	0.12	0.22	0.17	0.21	0.20	3.59	4.75	8.34	-1.16
F11	0.17	0.21	0.15	0.13	0.17	0.16	0.21	0.19	0.11	0.15	0.15	0.15	0.17	0.14	0.12	0.16	0.18	0.18	0.19	3.09	3.44	6.54	-0.35
F14	0.21	**0.28**	0.23	0.15	0.24	0.26	**0.29**	**0.27**	0.18	0.21	0.24	0.24	0.26	0.23	0.17	0.26	0.26	0.25	0.26	4.49	4.70	9.19	-0.21
F15	0.21	0.26	0.20	0.14	0.23	0.24	**0.27**	0.25	0.16	0.26	0.17	0.20	0.24	0.20	0.15	0.25	0.25	0.25	0.24	4.20	4.09	8.28	0.11
F21	0.24	**0.28**	0.22	0.19	**0.28**	0.26	**0.31**	**0.28**	0.19	0.26	0.25	0.20	0.27	0.24	0.20	**0.28**	**0.27**	**0.28**	**0.27**	4.76	4.09	8.85	0.67
F22	0.25	**0.29**	0.24	0.19	**0.28**	**0.27**	**0.31**	**0.29**	0.20	**0.28**	0.25	0.25	0.22	0.22	0.18	**0.28**	**0.28**	**0.28**	**0.27**	4.83	4.52	9.35	0.31
F25	0.26	**0.30**	0.23	0.21	**0.28**	**0.28**	**0.31**	**0.28**	0.21	**0.28**	0.24	0.26	0.26	0.19	0.21	**0.28**	**0.28**	**0.27**	**0.28**	4.90	3.85	8.76	1.05
F26	0.25	**0.29**	0.20	0.19	0.27	0.26	**0.29**	0.26	0.20	**0.27**	0.21	0.24	0.25	0.22	0.15	0.27	0.26	**0.27**	0.27	4.63	3.17	7.80	1.47
F28	0.19	0.26	0.17	0.17	0.25	0.24	0.27	0.25	0.18	0.25	0.21	0.23	0.24	0.19	0.14	0.19	0.25	0.23	0.22	4.13	4.61	8.75	-0.48
F29	0.25	**0.29**	0.23	0.19	**0.27**	0.27	**0.30**	**0.28**	0.20	**0.28**	0.23	0.25	0.27	0.22	0.17	**0.28**	0.22	**0.28**	0.27	4.75	4.58	9.34	0.17
F33	0.22	**0.28**	0.21	0.18	0.26	0.24	**0.29**	0.24	0.19	0.26	0.24	0.23	0.24	0.23	0.20	0.25	0.26	0.21	0.25	4.47	4.66	9.13	-0.19
F35	0.19	0.24	0.21	0.18	0.22	0.24	0.26	0.23	0.18	0.24	0.19	0.18	0.22	0.20	0.17	0.22	0.22	0.21	0.18	4.00	4.57	8.57	-0.57

Table H25 Average Matrix for Element 9

	F1	F5	F6	F8	F10	F11	F12	F19	F22	F26	F27	F29	F33	F34
F1	0.00	3.50	3.63	2.44	2.56	3.00	2.44	1.38	3.13	3.63	2.38	3.50	2.00	1.56
F5	3.31	0.00	3.38	1.63	1.44	1.50	2.63	2.38	1.88	2.50	3.00	2.44	2.38	3.50
F6	3.56	2.38	0.00	3.50	3.44	1.38	2.63	2.50	3.44	3.50	3.50	3.38	3.44	3.38
F8	2.88	2.63	3.50	0.00	2.38	1.63	1.38	2.56	3.38	3.50	3.56	3.44	2.38	3.38
F10	1.50	3.38	3.31	3.38	0.00	2.44	2.44	2.38	3.56	2.25	1.44	3.50	1.56	2.56
F11	3.25	3.31	2.75	1.56	1.56	0.00	3.38	0.56	2.38	2.56	3.63	2.50	2.38	2.38
F12	3.31	3.56	2.56	3.50	3.31	2.56	0.00	1.44	3.38	3.38	3.44	3.56	3.63	2.44
F19	2.38	1.44	1.63	3.50	0.44	0.56	0.31	0.00	2.38	3.56	3.63	1.50	3.38	3.38
F22	1.50	3.38	3.31	3.38	3.50	1.88	2.50	2.88	0.00	2.50	2.50	3.44	2.38	2.44
F26	1.63	3.50	2.38	2.38	0.63	1.31	1.44	1.63	1.44	0.00	1.38	1.00	3.50	2.56
F27	2.56	3.63	2.38	2.50	1.56	1.50	1.44	2.50	3.56	3.56	0.00	3.44	3.50	3.00
F29	1.63	2.63	3.38	3.44	0.00	2.50	3.50	2.50	3.63	3.31	3.38	0.00	3.38	3.50
F33	3.56	2.50	3.13	3.38	2.63	2.31	2.25	3.31	3.56	3.56	3.50	3.50	0.00	1.63
F34	2.56	2.38	2.38	3.38	3.50	2.75	1.56	3.38	3.38	3.56	3.63	3.44	3.13	0.00

Table H26 D Matrix for Element 9

	F1	F5	F6	F8	F10	F11	F12	F19	F22	F26	F27	F29	F33	F34
F1	0.00	0.08	0.09	0.06	0.06	0.07	0.06	0.03	0.08	0.09	0.06	0.08	0.05	0.04
F5	0.08	0.00	0.08	0.04	0.03	0.04	0.06	0.06	0.05	0.06	0.07	0.06	0.06	0.08
F6	0.09	0.06	0.00	0.08	0.08	0.03	0.06	0.06	0.08	0.08	0.08	0.08	0.08	0.08
F8	0.07	0.06	0.08	0.00	0.06	0.04	0.03	0.06	0.08	0.08	0.09	0.08	0.06	0.08
F10	0.04	0.08	0.08	0.08	0.00	0.06	0.06	0.06	0.09	0.05	0.03	0.08	0.04	0.06
F11	0.08	0.08	0.07	0.04	0.04	0.00	0.08	0.01	0.06	0.06	0.09	0.06	0.06	0.06
F12	0.08	0.09	0.06	0.08	0.08	0.06	0.00	0.03	0.08	0.08	0.08	0.09	0.09	0.06
F19	0.06	0.03	0.04	0.08	0.01	0.01	0.01	0.00	0.06	0.09	0.09	0.04	0.08	0.08
F22	0.04	0.08	0.08	0.08	0.08	0.05	0.06	0.07	0.00	0.06	0.06	0.08	0.06	0.06
F26	0.04	0.08	0.06	0.06	0.02	0.03	0.03	0.04	0.03	0.00	0.03	0.02	0.08	0.06
F27	0.06	0.09	0.06	0.06	0.04	0.04	0.03	0.06	0.09	0.09	0.00	0.08	0.08	0.07
F29	0.04	0.06	0.08	0.08	0.00	0.06	0.08	0.06	0.09	0.08	0.08	0.00	0.08	0.08
F33	0.09	0.06	0.08	0.08	0.06	0.06	0.05	0.08	0.09	0.09	0.08	0.08	0.00	0.04
F34	0.06	0.06	0.06	0.08	0.08	0.07	0.04	0.08	0.08	0.09	0.09	0.08	0.08	0.00

Table H27 T Matrix for Element 9

	F1	**F5**	**F6**	**F8**	**F10**	**F11**	**F12**	**F19**	**F22**	**F26**	**F27**	**F29**	**F33**	**F34**	**r**	**c**	**r+c**	**r-c**
F1	0.31	0.36	**0.43**	0.39	0.34	0.37	**0.43**	0.31	0.35	0.27	0.37	0.37	0.42	0.40	5.12	5.35	10.47	-0.23
F5	**0.43**	0.33	**0.46**	0.43	0.42	0.41	**0.48**	0.32	**0.43**	0.33	**0.43**	**0.43**	**0.44**	**0.44**	5.79	4.94	10.73	0.85
F6	**0.43**	0.40	0.40	**0.44**	0.42	0.39	**0.46**	0.32	**0.43**	0.31	0.41	**0.45**	**0.46**	**0.44**	5.75	6.08	11.83	-0.33
F8	0.41	0.36	**0.48**	0.37	0.42	0.36	**0.48**	0.36	**0.43**	0.31	0.41	**0.45**	**0.46**	**0.46**	5.77	5.56	11.33	0.21
F10	0.31	0.27	0.37	0.32	0.25	0.28	0.36	0.22	0.34	0.20	0.29	0.27	0.34	0.36	4.16	5.18	9.34	-1.02
F11	0.31	0.26	0.30	0.29	0.29	0.22	0.33	0.21	0.28	0.20	0.27	0.31	0.31	0.32	3.90	4.99	8.89	-1.09
F12	0.32	0.30	0.36	0.30	0.31	0.32	0.30	0.22	0.32	0.22	0.30	0.35	0.34	0.32	4.29	6.09	10.38	-1.80
F19	0.31	0.32	0.38	0.35	0.33	0.28	0.36	0.23	0.35	0.24	0.34	0.36	0.38	0.39	4.63	4.31	8.93	0.32
F22	**0.43**	0.38	**0.49**	**0.45**	0.43	0.39	**0.49**	0.35	0.37	0.29	**0.44**	**0.46**	**0.47**	**0.47**	5.91	5.43	11.35	0.48
F26	**0.46**	0.41	**0.52**	**0.48**	0.42	0.42	**0.51**	0.39	**0.45**	0.28	**0.46**	**0.48**	**0.50**	**0.50**	6.28	3.87	10.16	2.41
F27	0.41	0.40	**0.49**	**0.45**	0.38	0.42	**0.49**	0.37	0.42	0.29	0.36	**0.46**	**0.47**	**0.47**	5.89	5.34	11.23	0.55
F29	**0.44**	0.39	**0.48**	**0.45**	0.42	0.39	**0.49**	0.32	**0.44**	0.28	0.43	0.38	**0.47**	**0.47**	5.85	5.64	11.49	0.21
F33	0.39	0.38	**0.47**	0.42	0.37	0.38	**0.48**	0.36	0.41	0.33	0.43	**0.44**	0.38	**0.45**	5.68	5.85	11.53	-0.18
F34	0.37	0.39	**0.46**	0.42	0.38	0.37	**0.44**	0.35	0.40	0.30	0.40	**0.43**	0.41	0.37	5.48	5.87	11.35	-0.39

Table H28 Average Matrix for Element 10

	F1	**F2**	**F3**	**F4**	**F6**	**F7**	**F8**	**F11**	**F25**	**F29**	**F31**
F1	0.00	3.56	3.50	2.88	3.56	2.44	2.88	3.25	1.38	1.63	3.38
F2	2.63	0.00	0.56	1.75	2.50	0.38	0.50	3.25	0.38	2.31	3.44
F3	2.75	2.38	0.00	1.56	2.38	0.50	2.75	1.50	2.63	2.38	3.00
F4	3.50	2.44	3.44	0.00	1.50	0.38	3.31	0.50	2.50	3.63	2.38
F6	3.63	3.25	3.50	2.38	0.00	0.63	3.50	2.75	2.56	3.38	2.63
F7	3.38	2.75	2.56	0.50	1.50	0.00	1.31	3.44	0.56	2.63	3.38
F8	2.44	3.00	2.38	3.50	3.50	0.50	0.00	1.56	2.38	3.44	2.50
F11	3.00	3.44	3.56	2.00	1.38	1.50	1.63	0.00	1.38	2.50	2.56
F25	3.38	3.38	3.38	2.56	3.44	2.56	3.50	2.44	0.00	3.38	2.38
F29	3.50	3.50	2.44	3.25	3.38	1.63	3.44	2.50	2.50	0.00	1.38
F31	3.38	3.38	3.25	2.50	3.56	3.50	3.13	3.56	3.38	2.38	0.00

Table H29 D Matrix for Element 10

	F1	F2	F3	F4	F6	F7	F8	F11	F25	F29	F31
F1	0.00	0.11	0.11	0.09	0.11	0.08	0.09	0.10	0.04	0.05	0.11
F2	0.08	0.00	0.02	0.05	0.08	0.01	0.02	0.10	0.01	0.07	0.11
F3	0.09	0.07	0.00	0.05	0.07	0.02	0.09	0.05	0.08	0.07	0.09
F4	0.11	0.08	0.11	0.00	0.05	0.01	0.10	0.02	0.08	0.11	0.07
F6	0.11	0.10	0.11	0.07	0.00	0.02	0.11	0.09	0.08	0.11	0.08
F7	0.11	0.09	0.08	0.02	0.05	0.00	0.04	0.11	0.02	0.08	0.11
F8	0.08	0.09	0.07	0.11	0.11	0.02	0.00	0.05	0.07	0.11	0.08
F11	0.09	0.11	0.11	0.06	0.04	0.05	0.05	0.00	0.04	0.08	0.08
F25	0.11	0.11	0.11	0.08	0.11	0.08	0.11	0.08	0.00	0.11	0.07
F29	0.11	0.11	0.08	0.10	0.11	0.05	0.11	0.08	0.08	0.00	0.04
F31	0.11	0.11	0.10	0.08	0.11	0.11	0.10	0.11	0.11	0.07	0.00

Table H30 T Matrix for Element 10

	F1	F2	F3	F4	F6	F7	F8	F11	F25	F29	F31	r	c	r+c	r-c
F1	0.38	**0.48**	**0.44**	0.37	**0.43**	0.24	0.40	0.40	0.29	0.38	**0.43**	4.24	4.69	8.93	-0.45
F2	0.33	0.25	0.25	0.25	0.29	0.13	0.23	0.30	0.18	0.29	0.32	2.81	4.67	7.48	-1.86
F3	0.38	0.37	0.28	0.28	0.34	0.16	0.34	0.29	0.28	0.34	0.35	3.43	4.27	7.69	-0.84
F4	**0.42**	0.40	0.39	0.26	0.34	0.16	0.37	0.28	0.29	0.39	0.35	3.66	3.59	7.25	0.06
F6	**0.48**	**0.47**	**0.45**	0.37	0.34	0.20	**0.42**	0.38	0.33	**0.43**	**0.41**	4.27	4.13	8.40	0.15
F7	0.39	0.38	0.35	0.25	0.31	0.14	0.29	0.34	0.21	0.33	0.36	3.36	2.18	5.54	1.18
F8	**0.42**	**0.43**	0.38	0.37	**0.41**	0.18	0.30	0.32	0.30	**0.40**	0.37	3.87	3.96	7.83	-0.08
F11	0.39	**0.41**	0.38	0.30	0.31	0.19	0.31	0.25	0.24	0.34	0.35	3.46	3.78	7.24	-0.31
F25	**0.50**	**0.50**	**0.46**	0.39	**0.46**	0.26	**0.44**	0.40	0.27	**0.45**	**0.42**	4.55	3.08	7.63	1.47
F29	**0.47**	**0.47**	**0.41**	0.38	**0.42**	0.22	**0.41**	0.37	0.31	0.33	0.36	4.13	4.13	8.26	0.01
F31	**0.52**	**0.52**	**0.48**	0.40	**0.47**	0.30	**0.45**	**0.44**	0.37	**0.44**	0.37	4.77	4.09	8.86	0.68