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EDITORIAL PREFACE

This is the *First* Issue of Volume *Eight* for International Journal of Engineering (IJE). The Journal is published bi-monthly, with papers being peer reviewed to high international standards. The International Journal of Engineering is not limited to a specific aspect of engineering but it is devoted to the publication of high quality papers on all division of engineering in general. IJE intends to disseminate knowledge in the various disciplines of the engineering field from theoretical, practical and analytical research to physical implications and theoretical or quantitative discussion intended for academic and industrial progress. In order to position IJE as one of the good journal on engineering sciences, a group of highly valuable scholars are serving on the editorial board. The International Editorial Board ensures that significant developments in engineering from around the world are reflected in the Journal. Some important topics covers by journal are nuclear engineering, mechanical engineering, computer engineering, electrical engineering, civil & structural engineering etc.

The initial efforts helped to shape the editorial policy and to sharpen the focus of the journal. Started with Volume 8, 2014, IJE appears with more focused issues. Besides normal publications, IJE intend to organized special issues on more focused topics. Each special issue will have a designated editor (editors) – either member of the editorial board or another recognized specialist in the respective field.

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Up/Down Converter Linear Model with Feed Forward and Feedback Stability Analysis

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Abstract

After knowing most power electronics circuits, we can say that the operation that we expected are under ideal conditions. The goal of power conversion was achieved by proper circuit configuration and proper switching. Our electronics circuits are treated under ideal conditions and operate in a nominal way. The steady state in most power electronics circuit is periodic steady state. Usually the focus is in operation were the behavior is the same from cycle to cycle.

In this paper we will deal with disturbances that will cause the power electronics circuit to deviate from nominal. This includes unexpected changes in the input or load. Also we look at the transient due to start. This deviation from nominal is called dynamic behavior. If this dynamic behavior do not change the desired output significantly we do not do any corrective action. This is rarely the case, however.

We have to design the system in order not to deviate from the desired nominal conditions. We need a control system recover to desired specifications. The compensator must operate to restore nominal conditions. second, it must maintain the circuit and guide it to nominal conditions by advancing or delaying the switching time. In this paper we are going to analyze the dynamic behavior due to disturbances or fault and how to control and guide the system to normal.

The focus in this paper is dynamics and control and an appropriate model for the non linear circuit to apply this control. From our experience we conceder faults that the system might fall into and we consider treatment from these situations. In our treatment we consider more parameters and more elements to have more flexibility to control the system. The cost of falling in one of these faults might be too high so we have to think of a solution.

Keywords: Power Electronics, Converter, Control. Dynamic Behavior.

1. INTRODUCTION

First we have to select a good model. The model have to include the effect of the disturbance on the system and a controller that makes the regulating action. We have to specify nominal operation and in the case of disturbance we have to guide the system to this nominal.

In open loop control the controller is not given information about the system output. The open loop control use some measurements of input disturbance and feed forward the control signal to act to correct the output, feed forward alone usually is insufficient to give satisfactory results.

A better strategy is to measure how much the output departed from nominal. When the controller have this information, it will act rapidly and safely to restore the system to nominal. This is called

closed loop feedback control. If the model update itself on the base of measurements, we call it adaptive.

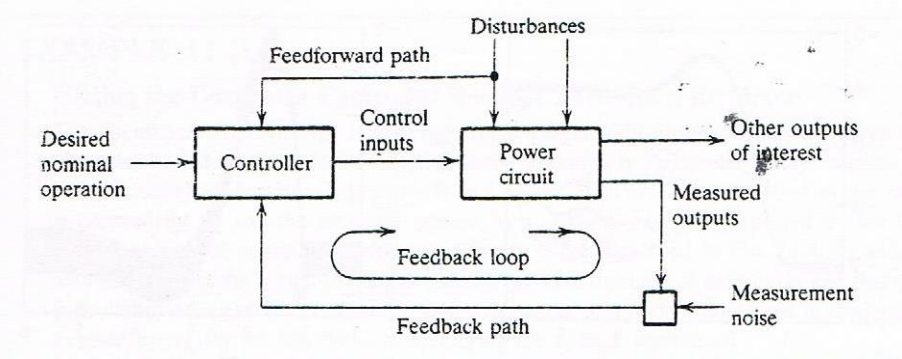

FIGURE 1: The Typical Control System Configuration.

A typical situation is figure 1. As you can see it is a feedback control loop. The measurement at the output is fed back to the controller to guide the system to nominal.

The input to the controller are disturbance and measured output and the desired value. Unmeasured disturbance and modeling error cause the controller to have undesired effects. The output given to the controller is corrupted by noise and we have also sensor noise. The noise and the modeling error and unmeasured disturbance all causes inaccuracies.

2. OPEN-LOOP CONTROL WITH FEED FORWARD FOR AN UP/DOWN CONVERTER

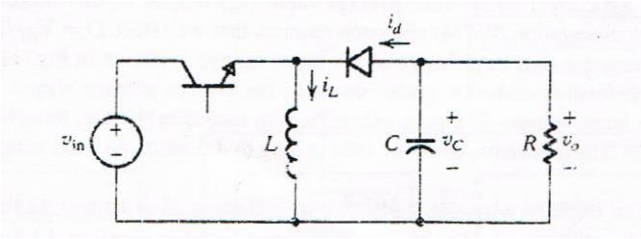

FIGURE 2: Circuit Schematic of the Power Stage of an Up/Down Converter.

Let us conceder the up/down dc/dc converter in figure 2. It operates at frequency 50khz R=2 Ohm C=220 micro F and L=.25 mH. We want to keep the output within 5% of the nominal value Vout=-9 v despite a change in the input from 12v to 8v. to simplify things let us assume that the transistor and diode are ideal switches.

For this dc/dc converter Vout = -Vin (D/D') were D is the duty cycle and D' =(1-D). For our specification D = .43 and the dc/dc converter operate in the continuous mode.

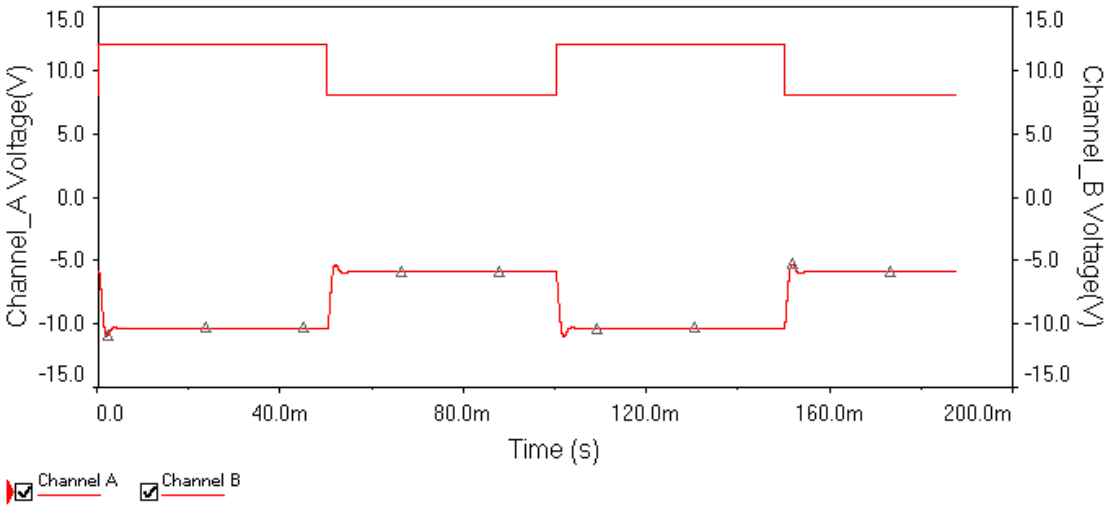

FIGURE 3: Response to the System as Vin Change from 12v to 8v.

As we can see in figure 3 as the input change from 12v to 8v the output change. The system give us the nominal voltage when the input is 12v. As the input change to 8v in a step the output will go on oscillatory transients and settles down to incorrect value. We will explain the transient by a model that we will develop.

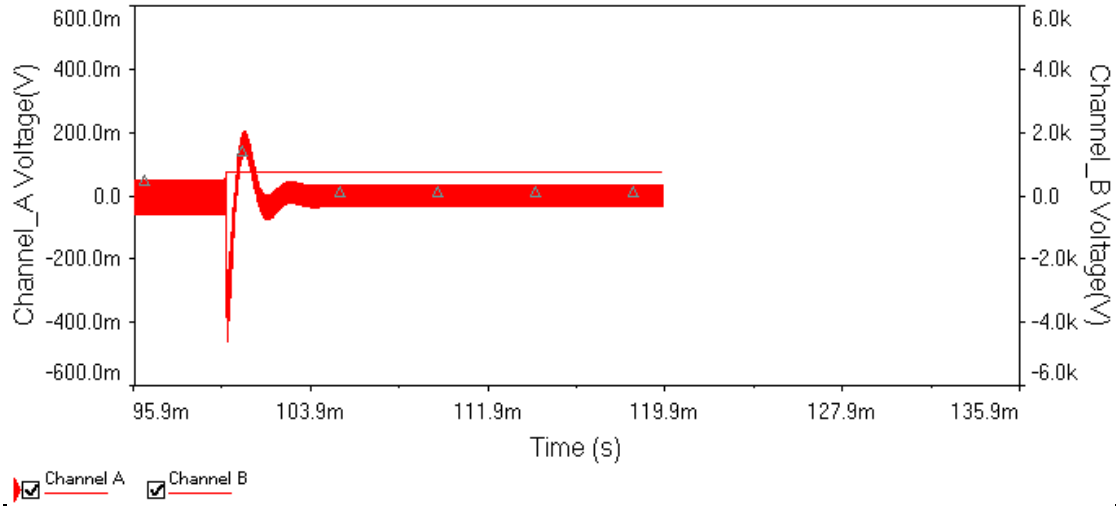

FIGURE 4: We have Feed Forward Using PWM.

A solution to the change in the input voltage is to use feed forward. If D is made to vary so that –VinD/D' is constant as Vin changes, this can be a solution to make Vout constant. This pulse width modulation need to chose D=Vref/(Vref-Vin).

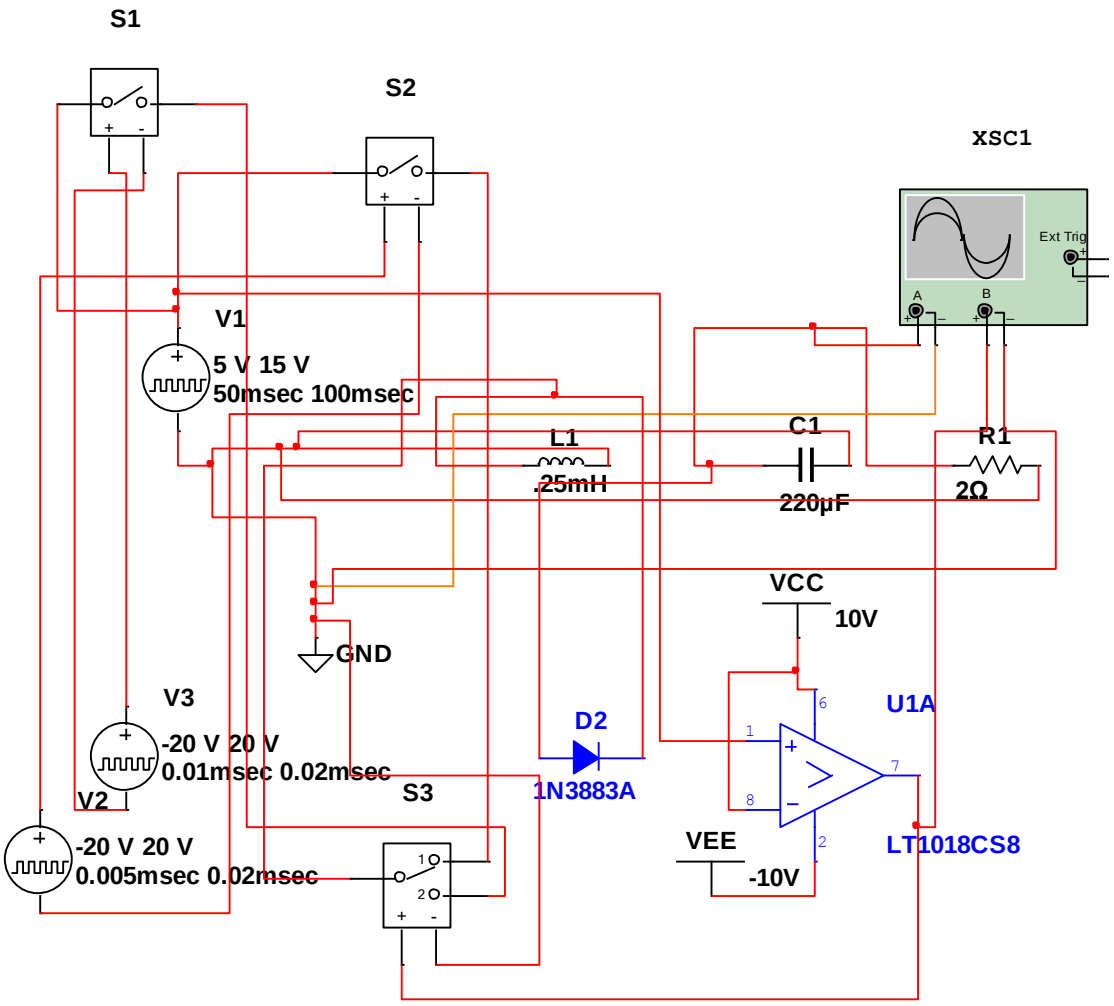

FIGURE 5: We Have Feed Forward Using PWM.

The resulting response is as in figure 4. The system now settles to the reference voltage even if the input vary. As we can see we have a transient that take a long time to die out as without feed forward.

3. A LINEAR MODEL FOR THE UP/DOWN CONVERTER TO EXPLAIN THE TRANSIENT

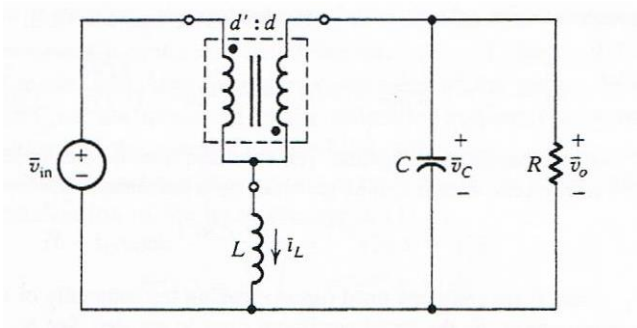

FIGURE 5: A Linear Model for Up/Down Converter To Explain the Transient .

The linear model that can explain the transient is as shown in figure 5. The linear transformer is replaced for the two switches the transistor and diode. We also replace instantaneous quantity by the average.

This averaged circuit can be used as a basis to generate other types of analytical model such as state space model. The circuit can be used in simulation packages. Note that this circuit depend nonlinearly on the control variable d(t). The process of linearization deal with this nonlinearity.

When d is constant the analysis is straightforward. By that we mean the circuit can be used to read voltages and currents when we have v in and D. in the steady state the inductor voltage and the capacitor current is zero. So we can say that

$$I_L = \langle i_L \rangle = -\frac{V_o}{RD'} \quad \text{and} \quad V_o = \langle v_o \rangle = -V_{\text{in}}\frac{D}{D'}$$

This averaged circuit give us a basis to understand the result in figure 3. Were we examine the open loop response to the step in the input Vin. D is constant. The transfer function is given as

$$\frac{\overline{v}_o(s)}{\overline{v}_{\text{in}}(s)} = \frac{-D'D/LC}{s^2 + (1/RC)s + (D'^2/LC)}$$

The switching period is small if we compare with the settling time so we can use this approximation.

The response is determined by the poles of the under damped system

$$\lambda_1 = \lambda_2^* = -\frac{1}{2RC} + j\omega_D \quad \text{and} \quad \omega_D = \sqrt{\frac{D'^2}{LC} - \frac{1}{4R^2C^2}}$$

These poles give us the response

$$c_1 e^{\lambda_1 t} + c_1^* e^{\lambda_1^* t} = ce^{-t/(2RC)}\sin(\omega_D t + \theta)$$

A graph of response is figure 3

A detailed calculation biased on the transfer function account very well not only qualitatively but also quantitatively for the average behavior of the open loop step response. The time constant 2RC is 880 micro s or 44 switching cycle. And the period 2 pi/w is 2924 micro s or 145 cycle. A similar calculation can be carried out with feed forward. In this case D change as a step as well by a value determined by V in. next we will develop a model for forward feed back that includes PWM by D to control the system.

4. THE UP/DOWN CONVERTER LINEAR MODEL INCLUDING FEED FORWARD AS PWM MODULATED BY THE CHANGING INPUT TO CONTROL THE SYSTEM

The linearized model is obtained of figure 5 by replacing all voltage sources and current sources by the perturbation from nominal and replacing the averaged conical cell by its linearized version. All other elements are linear so they stay the same. The result is figure 6 with v in as the change is input voltage from its nominal dc value

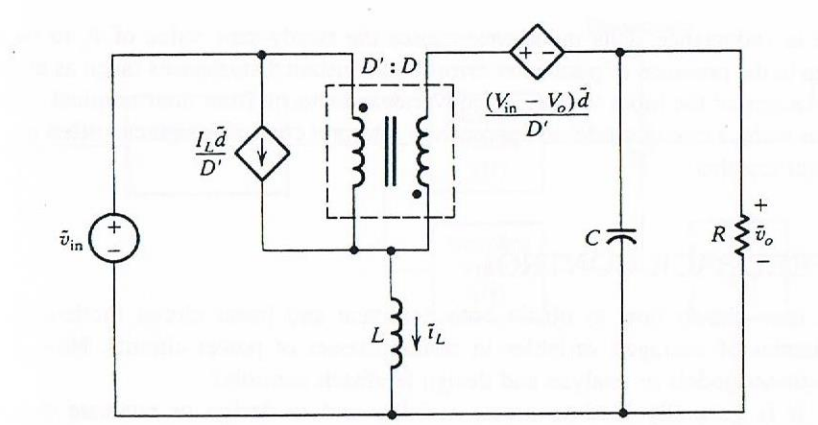

FIGURE 6: The Linearized Up/Down Converter Model Including Feed Forward by D For Simulation Using Circuit Software.

This model give us a linear model which result on constant output Figure 4. We can solve for the transfer function.

$$\frac{\tilde{v}_o(s)}{\tilde{d}(s)} = \left(\frac{I_L}{C}\right) \frac{s - (V_{in}/LI_L)}{s^2 + (1/RC)s + (D'^2/LC)}$$

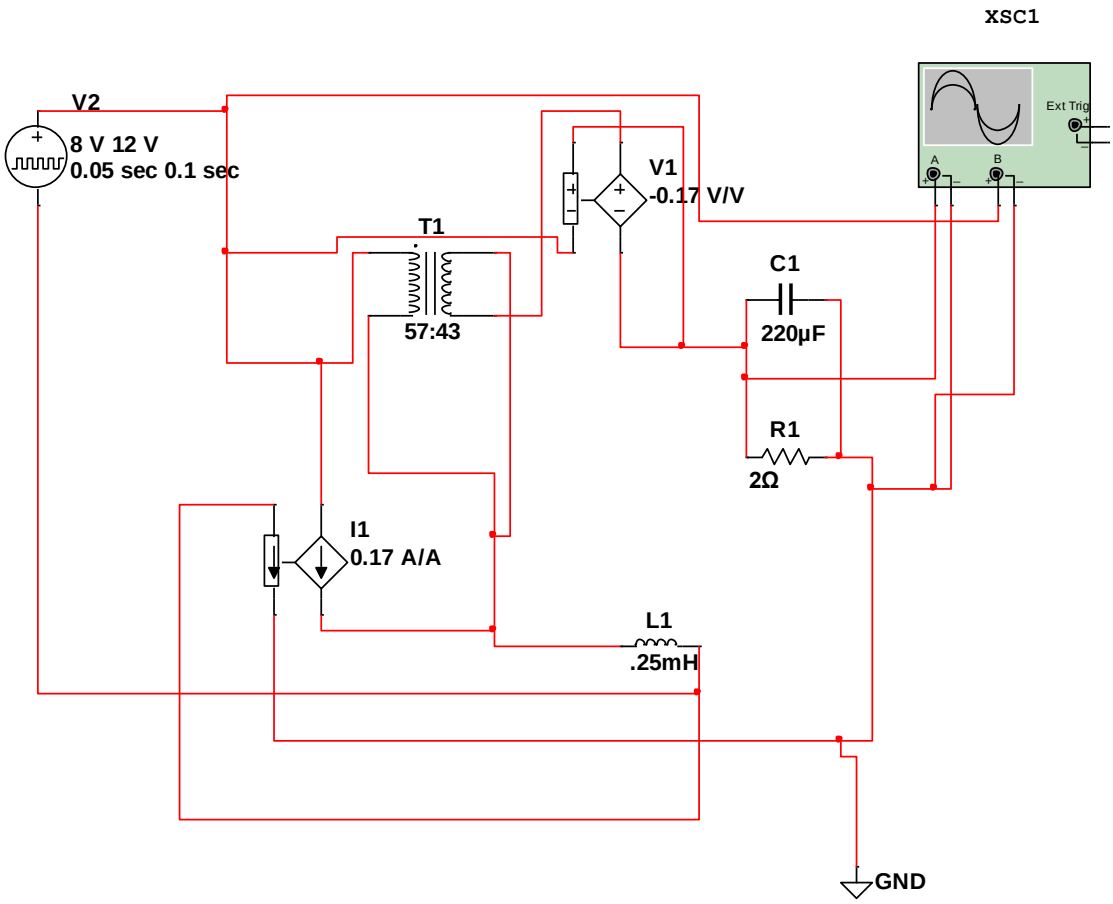

FIGURE 7: Simulation of The Circuit In Figure 6.

This is a good example of feed forward and also a good starting point for proportional feed back which we will develop next.

5. PROPORTIONAL FEED BACK CONTROL OF AN UP/DOWN CONVERTER

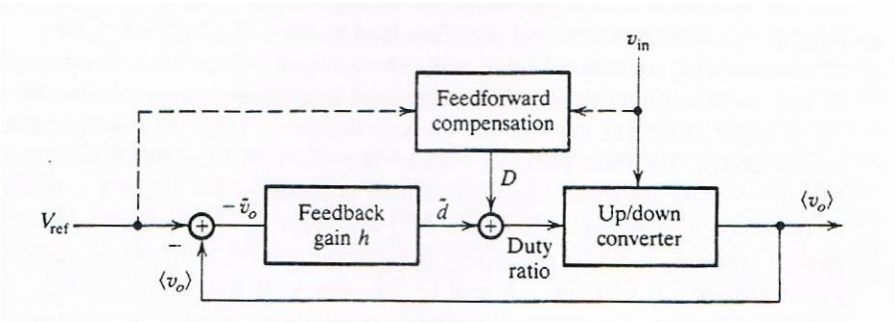

FIGURE 7: Proportional Feed Back Control of Up/Down Converter.

The desire for better performance than obtained with open loop and feed forward of the up/down converter lead us to conceder feed back control solution. We have to measure the output and see how much it deviate from the nominal V out = -9 volt. And use the error to adjust the duty cycle.

We look at Vout. If V out-V ref is negative we should decrease the duty ratio. Similarly if the error is positive we should increase the duty ratio. This is the natural PWM control law suggested by steady state characteristics.

The proportional feedback control system in figure 7 is one implementation of this law. The change in duty ratio is proportional to the deviation in V out. H is the feedback gain. The block diagram show that feed forward examined earlier is included.

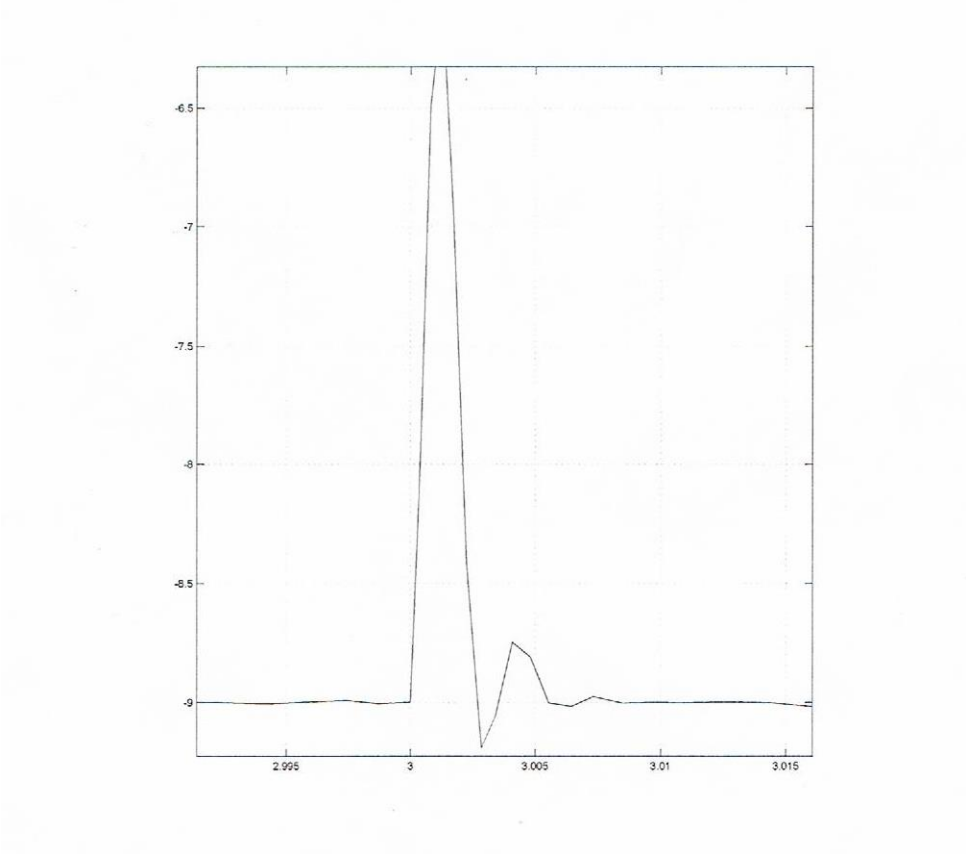

FIGURE 8: Show the response to the same step for gain -.03 with feed back and feed forward in place. The response become oscillatory and goes unstable for very negative h.

6. STABILITY OF UP/DOWN CONVERTER UNDER PROPORTIONAL FEEDBACK

We want to explain this result. The feed forward does not effect stability so we ignore it in this example. The diagram will look like this

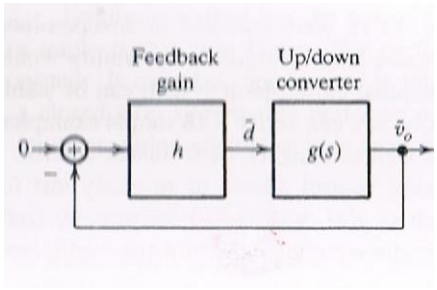

FIGURE 9: The Block Diagram of the Control System.

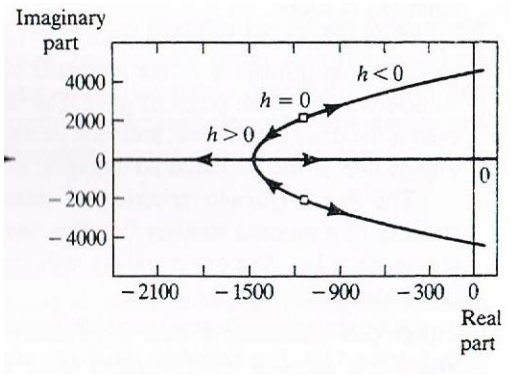

FIGURE 10: The Poles As The Gain Change.

The transfer function g(s) is the same as given. The sensitivity function in this case is

$$\mu(s) = \frac{s^2 + (1/RC)s + (D'^2/LC)}{\left[s^2 + (1/RC)s + (D'^2/LC)\right] + h(I_L/C)\left[s - (V_{\text{in}}/LI_L)\right]}$$

To satisfy the stability condition h has to be

$$-\frac{1}{I_L R} < h < \frac{D'^2}{V_{\text{in}}}$$

The roots are also the natural frequencies of the system. Figure 10 shows the roots as h changes. As decreases and become more negative the roots are closer to the imaginary part and the graph in the time domain correlate very will with the roots. For small value of h as it increases the roots move away from the imaginary axis giving a more damped response. This also correlate very well with the time domain response.

7. COMPARATIVE EVALUATION

Vorperian did some work on this (Simplified analysis of PWM converters using a model of PWM switch) in 1990. Lee did some work (Equivalent circuit models for switched power converter) in 1989. Doyle and his book (Feedback control theory) talk about this in 1991.

8. CONCLUSION

Simulation and modeling is important. For example this up down converter is non linear. Can we make a linear system that will give us the same output?

Let us say that system one is a square wave at the switching frequency which is the input to an RC circuit. System two is an RLC circuit with a step response as the transient of the up/down converter. The sum of the output of system one and two is the same as the output of the converter and system one and two are linear. This is a linear system which have the same output as the non linear.

For more critical discussion let us say the input to the RC circuit have D duty cycle. The sum of system one and two will be exactly the same as the non linear converter.

I think the correlation between the two systems will be a potential for future research . As you can see this system is linear and the up/down converter is not. The output of the two are the same signal. How can we correlate between the two?

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Implications Of Human Resource Variables On Supply Chain Performance And Competitiveness

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Abstract

This paper proposes a conceptual model indicating the effect of Human Resource (HR) variables on supply chain (SC) performance and to suggest best approach suited for Indian manufacturing organizations, in general, and automotive industries, in particular. This study is a part of a larger research project exploring SC related practices. The methodology of critical evaluation involved literature review of empirical research articles on performance measurement, SCM and HR practices. A critical analysis is carried out so as to identify research gaps in content of effect of HR on performance measurement of supply chains, as well as to propose directions for future research. A conceptual model is also proposed. Critical investigation of selected articles led to an idea that there can be significant effect of the role of human involvement on overall SC Performance. It is to be seen that how various parameters, taken from the literature review, affect SC performance and ultimately contributing to its competitiveness. The study is limited to supply chains of the automotive industries and their ancillaries located in Malwa region of M.P., India. Further research can be carried out by using data of various supply chains located in other parts of India to generalize the research. Also, other sectors and industries can be included.

Keywords: SCM, Performance Measurement, HR Variables, OCB, Automotive Industry.

1. INTRODUCTION

A typical supply chain incorporates the sequence of organizations - their facilities, functions, and activities - that are involved in producing and delivering a product or service with a view of effectively managing material, information and money flows. A supply chain consists of all stages involved, directly or indirectly, in fulfilling a customer request. Its existence is to satisfy customer needs, in the process generating profits for itself. It not only includes the manufacturer and suppliers, but also transporters, warehouses, retailers, and customers themselves.

In the era of globalization, supply chains are being treated as extended enterprises. This arises from the attempts of the enterprises, being in different physical situations, and using the partners to gain competitive advantage. Supply chains are responsible for the entire lifetime of the product, from preparation of materials and supply management, to production and manufacturing, distribution and customer service, and ultimately recycling and disposal at the end of product life (Jagdev and Browne,1998). Given the trans-organizational nature of supply chains, they are not

organizations according to conventional definitions (Scott, 1998), but they do exhibit many of the same features, such as a social structure, participants, goals, and technology (Ketchen & Guinipero, 2004; Leavitt, 1965). Thus, a supply chain represents an organization of linked suppliers and customers, with every customer being a supplier to the next downstream organization until a finished product reaches the ultimate end-user (Handfield & Nichols, 2003).

In manufacturing organizations today, competition parameters have changed from manufacturing site versus manufacturing site to supply chain versus supply chain. Improvement in the supply chain is critical to a company's bottom line in the current era of global sourcing and global competition. Indian industry is facing competition both from multinational companies and imports in the domestic markets. The new competition is in terms of improved quality, products with higher performance, reduced cost, a wider range of products and better service; all delivered simultaneously (Dangayach and Deshmukh, 2003).

Market developments, including intense international competition, fragmented and demanding markets and diverse and rapidly changing technologies (Teece et al.,1997), have created new imperatives for competition, moving increasingly from the level of the individual organization to networks of disparate companies. Within these networks companies have to focus on collaborative efforts and initiatives to continuously improve and change the current processes and work practices in order to keep pace with the external dynamics in the business environment. Therefore, the individual company is becoming an insufficient entity to identify improvement projects (Harland et al., 1999) and, accordingly, companies have to identify and implement improvement initiatives in an inter-organizational context, leading to the concept of collaborative improvement.

There is an increasing need to understand and to develop knowledge on the improvement and learning processes that take place at the inter-company level (Boer et al., 2000). Consequently, the concept of continuous improvement, which by now is a consolidated concept in the context of stand-alone companies, has been transferred and extended to the level of 'collaborative' continuous improvement, leading to the concept of collaborative improvement. Collaborative improvement (CoI) is defined as: "a purposeful inter-company interactive process that focuses on continuous incremental innovation aimed at enhancing the Extended Manufacturing Enterprise overall performance" (Cagliano et al., 2002). The key to collaborative improvement is learning and development (Boer et al., 2000). However, the process of cultivating collaborative improvement across disparate companies within a network is fraught with difficulties that encompass a wide array of intra- and inter-organizational change issues and working practices.

Therefore, companies have to apply and to use approaches that enable them to tackle these difficulties of inter-organizational change. A stream of strategy research has emerged that generally posits that organizational resources and capabilities that are rare, valuable, non-substitutable, and imperfectly imitable form the basis for a firm's sustained competitive advantage (e.g., Barney, 1986a, 1991). This "resource based view" (Conner, 1991; Wernerfelt, 1984) of organizational strategy and competitive advantage has recently engendered a great deal of theoretical and empirical efforts (Amit & Schoemaker, 1993; Barney, 1991; Conner, 1991; Hansen & Wernerfelt, 1989; Lado, Boyd, & Wright, 1992; Mahoney & Pandian, 1992; Reed & DeFillippi, 1990; Rumelt, 1991; Teece, Pisano, & Shuen, 1990).

HR managers and professionals can exert upward influence on top management through synthesizing information and knowledge about how productive their employees can be (Floyd & Woodridge, 1992). An organization's HR system can be viewed as a repository of knowledge about firm-specific knowledge, skills, abilities, relationships, and the work-related values of its employees. Such knowledge, which labor economists refer to as organizational capital (Prescott & Visscher, 1980; Tomer, 1987), is specific to the organization's technology, structure, and processes, is socially generated through interactions among human resource professionals and line managers, and is embedded in the firm's unique history. To the extent that such knowledge

enables members of the firm to attract, develop, and retain employees with competencies that surpass those of competitors, it may contribute to sustained competitive advantage.

Organizational competencies must be continually replenished, upgraded, and deployed in order for the firm to gain and keep a competitive advantage (Amit & Schoemaker, 1993; Porter, 1985; Ranson, 1987; Reed & DeFillippi, 1990; Stalk et al., 1992). As previously discussed, organizational competencies may be expanded, upgraded, and maintained through HR systems that emphasize hiring employees for the organization as a whole (Bowen et al., 1991), extensive socialization of newly hired employees (Wanous, 1992), developmental performance appraisal (Latham & Wexley, 1991; Murphy & Cleveland, 1991), skill-based compensation strategy (Lawler, 1992), and comprehensive training and development to provide new KSAs, which are needed to achieve long-run productivity (Wexley & Latham, 1991). Conversely, organizational competencies can depreciate through, among other things, lack of value congruence between the focal employee and the organization (Argyris, 1957), ethically ambivalent human resource practices (Jansen & Von Glinow, 1985), assignment of employees to jobs with low perceived significance and meaningfulness (Hackman & Oldham, 1976),

This paper will focus on critically discussing the implications of the HR variables on supply chain performance and subsequently on competitiveness of the firm. In the paper, we will introduce firstly the concept of the supply chain and supply chain management. Secondly, we will discuss briefly various performance measurement approaches. Then, the need of human involvement within the firm will be discussed by taking few HR variables. Finally, we will discuss and reflect on the overall effect of HR variables on the chosen parameters. In totality, the paper contributes to the design and implementation of a conceptual framework incorporating few critical HR variables in Indian manufacturing organizations.

2. SUPPLY CHAIN AND SUPPLY CHAIN MANAGEMENT

A supply chain (SC) is a network of organizations to perform a variety of processes and activities thereby generating value in the form of products and services to end consumers (Christopher, 1992). Alternatively, a supply chain is a network of organizations that are involved, through upstream and downstream linkages, in the different processes and activities that produce value in the form of products and services in the hands of the end customer (Christopher, 1998).

A supply chain is defined as the “network of facilities and activities that performs the functions of product development, procurement of material from suppliers, the movement of materials between facilities, the manufacturing of products, the distribution of finished goods to customers, and after-market support for sustainment” (Mabert & Venkataramanan, 1998). The management of these functions may be conducted within a single organization's borders while others cross these borders of traditional organizations (Levy, 1994; Mentzer et al., 2001).

Supply chain management (SCM) is an integrated function with full responsibility on linking business functions and process, with and through companies, managing the dynamic of financial, material and information flows, between the different stages of supply chain. SCM is one of business strategy increasingly being used in the business world today and has become the focus of academic as well as corporate attention in recent years (Ballou, Gilbert & Mukherjee, 2000). As the concept of SCM is still in development, several theoretical frameworks and research methodologies are needed to be developed (Tage, 1999). However, many articles have been published in various disciplines to try to define the SCM and discuss future directions and the corresponding empirical research methodology (Cooper, et al., 1997; Lambert & Cooper, 2000; Larson & Rogers, 1998; Tage, 1999). Supply chain management practices as a multi-dimensional construct that encompasses upstream and downstream sides of supply chain (Li et al, 2006). Practices like outsourcing, supplier partnership, information sharing, cycle time, compression and continuous process flow, are part of SCM (Donlon, 1996). SCM involves an integrated and process-oriented approach to the management, design and control of the supply chain, with the

aim of producing value for the end consumer, by both customer service and reduce cost (Bowersox and Class, 1996).

3. PERFORMANCE MEASUREMENT APPROACHES

Performance Measurement (PM) is the process of quantifying the effectiveness and efficiency of actions. Supply Chain Performance (SCP) refers to the overall supply chain‘s activities in meeting end-customer requirements, which include product availability, on-time delivery, and all the necessary inventory and capacity in the supply chain to deliver that performance in a responsive manner. SCP crosses company boundaries since it includes basic raw materials, components, sub-assemblies and finished products, and their distribution through various channels to the end customer. It also crosses traditional functional organization boundaries such as procurement, manufacturing, distribution, marketing, sales, and research & development. In the Indian context, there have been many attempts to measure the performance at the organizational level, but very few attempts have been made to measure the performance at inter-organizational level (Saad and Patel, 2006).

New organizations have to deal with various kinds of performance pressures and suitable approaches are needed (Gunasekaran et al., 2005). The study is also the direct justification for the need of a new performance measurement and costing system. Supporting the idea of new performance measurement system, few other approaches have been proposed. There is an integrated approach for measuring supply chain performance, combining economic value added (EVA), the balanced scorecard (BSC) and activity based costing (ABC), clearly emphasizing the need of overhead handling and a balanced approach (Yao and Liu, 2006).Other approaches focuses on ERP-based supply chain performance and proposes an integrated method, total related cost measurement, to evaluate supply chain performance of a three-echelon, ERP-based supply chain system (Ho, 2007).

Many researchers have proposed new performance measures and metrics considering the changes in markets and enterprise environments. However, there are some confusion surrounding those measures and metrics regarding their importance and specific areas of application in SCM systems. The use of new emerging metrics defined in five categories has been suggested: external, consumer, value-based competition, network performance, and intellectual capital (Basu, 2001). A study based on a survey of 22 firms‘ SC systems, concluded that SC partners do not share a common vision of or react to the same set of metrics (Spekman et al., 1998). Recently, many research papers that deal with performance measurement in a SC context (Van Hoek, 1998) have appeared in the literature. However, most of them are prescriptive and not based on historical facts and their analysis and changing market and operations environments or well grounded empirical analysis.

TABLE 1: Journal article and books of performance measurement systems and metrics for SC.

Author(s)	Year	Author(s)	Year
Artz	1999	Li, G. et al	2005
Baiman et al	2001	Li, S. et al	2005
Beamon	1998, 1999	Lockamy and McCormack	2004
Bourne et al	2000, 2002	Lohman et al	2004
Cachon and Lariviere	1999	Lummus et al	2003
Chan	2003	Maloni and Benton	1997
Chan and Qi	2003	Melnyk et al	2004
Chen and Paulraj	2004	Ramdas and Spekman	2000
Dasgupta	2003	Schmitz and Platts	2004

Toni, D. and Tonchia	2001	Stephens	2001
Fynes et al	2005	Talluri and Sarkis	2002
Graham et al	1994	Van der Vorst and Beulens	2001
Gunasekaran et al	2001, 2004, 2005	Van Hoek	2001
Harrison and New	2002	Wang et al	2004, 2005
Holmberg	2000	Webster	2002
Huang et al	2004, 2005	Windischer	2003
Kleijnen and Smits	2003	Windischer and Grote	2003
Lai et al	2002		

Source: Adapted from Craig Shepherd (2006)

4. HR VARIABLES

Considering a company's human resources to be a major source of its sustainable competitive advantage means that we need in-depth studies of the relationship between the way the human resources are managed and the strategy of the company (Karami, Analoui and Cusworth, 2004). The debate on the nature of this relationship has been intense, especially that conducted from the RBV, centring on competitive success and organisational efficiency (Guest, 1990; Analoui, 1999).

In this way, through the personal competencies that the employees possess and apply in the execution of their jobs, the company's human resources become key strategic factors for gaining and maintaining its competitive advantage (Pfeffer, 1994). Several authors have analysed the influence of the employees' attributes on the results of the company (Barney and Zajac, 1994; Hitt, Bierman, Shimizu, Kochhar, 2001; Pfeffer, 1994; Sherer, 1995) and how their personal competencies are the potential source of competitive advantage (Barney, 1991; Ulrico and Lake, 1991; Snell, Youndt and Wright, 1996; Wright and McMahan, 1992).

Since a company's workforce is essential for achieving competitive advantage through individuals' competencies (Pfeffer, 1994), companies need to invest adequately to recruit, train and retain employees who possess the kinds of knowledge, abilities and behaviours required by their strategy (Coff, 1997). In this way, the organisation builds a human capital adapted to the needs of the competitive situation and, at the same time, highly specific to the company (Pfeffer, 1994). In this context the HRM activities become a valuable organisational factor since they are the principal means of reinforcing those behaviours of the employees that the organisation needs (Wright and McMahan, 1992).

In addition, recent research suggests that effective HRM practices are related to improved organisational performance and in themselves are a source of competitive advantage (Arthur, 1994; Delaney and Huselid, 1996; Huselid, 1995; Huselid et al, 1997; Huselid, Jackson and Schuler, 1997; MacDuffie, 1995; Wright, Dunford and Snell, 2001).

In the current literature, it is recognised that personal competencies are potentially valuable as a source of competitive advantage for the company, although these resources would only contribute effectively to this end when the management aligns the competencies with the organisational objectives, and then only if the company is capable of retaining those employees that possess the key knowledge, abilities and behaviours needed to achieve and maintain its competitive advantage (Coff, 1997; Rodríguez, Patel, Bright, Gregory and Gowing, 2002). In other words, the individual competencies in themselves do not generate competitive advantage; this is usually created by special competence in way that they are managed (Zingheim, Ledford and Schuster, 1996; Zingheim and Schuster, 2003). This is clearly evident, because employees of different companies often appear to possess and demonstrate very similar competencies in the execution of their jobs, but achieve very different results for their company; therefore competitive

advantage cannot be due simply to the presence or absence of such competencies, but to the way in which they are managed (Zingheim, Ledford and Schuster, 1996; Zingheim and Schuster, 1996). Therefore it is necessary to analyse the connection between the HRM practices of a company and the personal competencies of its various employees.

The resource based view (Barney, 1991), explains that collectively, a firm's human resources are believed to have implications for firm's performance and provide a unique source of competitive advantage. It was also concluded that a firm's human capital is believed to be an important source of sustained competitive advantage Hayton (2003). Such advantage is thought to be more pronounced when 'socially complex resources . . . [that] are difficult to imitate' (Barney, 1995: 55), such as trust, friendship and team-working, are essential components of the production process. The supply chain encompasses all the activities associated with the flow and transformation of goods from the raw materials stage, through to the end user, as well as the associated information flows (Handfield, 2002). Manufacturers wish to position themselves so they have more flexibility and reduced lead time in their supply chain processes, and less obsolete inventory. Since a supply chain set up involves higher degree of interdependencies and information sharing, the role of trust, commitment, citizenship behavior and social networks becomes more important, beginning with the firm and ultimately extending to various supply chain partners.

A critical review of literature suggests authors about few HR variables having most effect on the performance measurement and possible correlations between them is intended to be established.

4.1 Trust

Trust is defined as willingness to take risks (Mayer et al., 1995). Trust exists when one party has confidence in an exchange partner's reliability and integrity (Morgan and Hunt, 1994). Research has shown that information provided by a trusted party is used more and thus provide a greater value to the recipient (Moorman, Deshpande, and Zaltman, 1992). Any collaborative relationship relies on relational forms of exchange characterized by high levels of trust (Dwyer, Schurr, and Oh, 1987; Morgan and Hunt, 1994). A high level of trust enables parties to focus on the long-term benefits of the relationship (Ganesan, 1994), ultimately enhancing competitiveness and reducing transaction costs (Noordewier, John, and Nevin, 1990). Organizations need trust in order to be flexible and agile. When both commitment and trust are present simultaneously, they produce outcomes that encourage efficiency, productivity and effectiveness (Morgan and Hunt, 1994). Researchers found out that lack of trust lead to higher transaction costs and agency costs while a high level of trust encourages open communication and willingness to take risks and the overall performance would be enhanced if the problems of distrust were reduced (Beccera and Gupta, 1999). An efficient supply chain performance requires commitment among the internal supply chain members and trust is a significant element to keep up such commitment.

4.2 Commitment

This Commitment is defined as an exchange partner believing that an outgoing relationship with another is so important as to warrant maximum efforts at maintaining it, that is, the committed party believes the relationship endures indefinitely (Morgan and Hunt, 1994). Commitment is central to all of the relational exchanges within a firm as well as between the firms and its various partners. Inter-organizational transactions are usually managed through requests that, upon mutual agreement, form the basis of commitments. It was also observed that successful managers engage in many conversations in which they create, take care of and initiate new commitments. Trust was found to be a major determinant in relationship commitment.

4.3 Citizenship Behavior

Higher levels of organizational investment are associated with social exchange relationships that create feelings of employee obligation which in turn influences employees to benefit the organization through behaviors that exceed minimal requirements of employment (Shore et al.,2006). On the basis of reciprocity norms, employees will be inclined to increase their personal contribution and efforts and ultimately exhibit extra-role behaviors (Tsui, Pearce, Porter, and

Tripoli, 1997). Organizational citizenship is unrestricted behavior that is not part of an employee's formal job requirements, but that on the other hand promotes the effective functioning of the organization (Robbins, 1996). OCB reflects a "good soldier syndrome" which is necessary for the prosperity and good functioning of every organization (Organ, 1988). It means doing a better job, taking an effort above and ahead of formal requirements, and filling the gap between procedures and guidelines on the one hand, and dynamic reality on the other. OCB is usually perceived as exerting exceptionally good behaviors for the sake of the organization and unofficially supporting its members. Obviously, such behaviors are vital to organizations since they affect their competitiveness and profitability.

4.4 Social Networks

In our framework, social networks refer to the set of relationship employees have in their own organization (internal networks) and outside their organizations (external networks). Networks differ in size, i.e., number of contacts, and range, i.e., diversity of contacts (Burt, 1982) and strength of ties between the employees. Strong ties are characterized by long duration and are exercised frequently and emotionally close. Internal networks that are large and diverse in range add value to a firm in the form of information advantage. Generally , larger networks contain more capacity for information than smaller networks (Burt, 1982; Granovetter, 1973) and networks with linkages to many different departments, hierarchical levels potentially contain more diverse and novel information (Burt, 1982). Large networks are potentially but not necessarily diverse (Granovetter, 1973). The internal network provide opportunities to exploit information a firm already holds, and therefore structured internal networks maximizes information gathering and may provide distinct competitive advantage to firms

5. CONCEPTUAL MODEL

Conceptually this paper proposes that member's citizenship behaviour, collaborative orientation based on trust and commitment and social networks will significantly influence supply chain performance and eventually improve firm performance. All these variables are idiosyncratic because they are created through firm specific practices and lead to sustainable competitive advantage. Earlier researches (e.g., Huselid, Jackson, and Schuler, 1997; Vandenberg, Richardson, and Eastman, 1999) have already proved that substantial investment in human capital may enhance corporate financial performance and signal to employees that they represent a major source of competitive advantage for the company (Fiorito, Bozeman, and Young, 1997).

HR practices can only be a source of sustained competitive advantage when they support re-sources or competencies that provide value to a firm (Wright et al., 2001).

The proposed conceptual model is shown in figure 1 below.

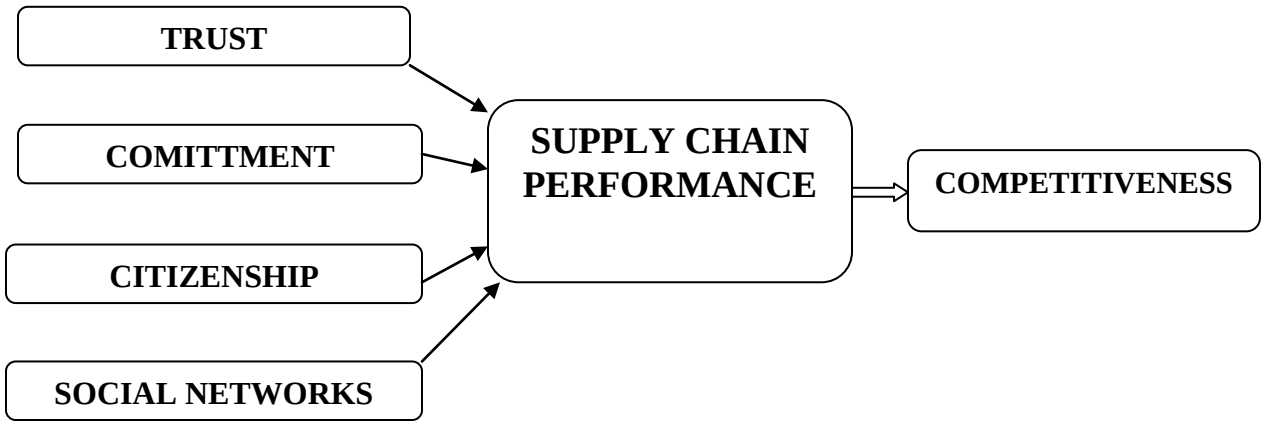

FIGURE 1: Proposed Conceptual Model (Marwah, A.K., et al, 2012).

6. DISCUSSIONS

The increasingly global nature of competition requires that firms utilize all of their available resources in order to survive and succeed. It was concluded that this phenomenon has resulted in an emphasis on the alignment of all functional activities of the firm (e.g., finance, marketing, operations) toward the achievement of strategic objectives (Wright, McMahan, McCormick, and Sherman, 1998). One consequence of this trend is that many have called for a new strategic role for the HR function. This role entails two major aspects. First, the HR executive should provide input into the firm's strategy to ensure that the firm has the human resource capabilities to implement new strategies. Second, the HR function needs to ensure that the HR programs and practices are in place to effectively implement the strategy.

Research has identified a variety of collaboration enablers including the following: aligned objectives, a shared customer-oriented vision, technological connectivity, relationship trust, supplier development, and process redesign and integration (Barratt, 2004; Drucker, 2001; Funk, 1995; Grzeskowiak et al., 2007; Lambert and Knemeyer, 2004; Lee, 2004; Stonebraker and Afifi, 2004).

The centrality of human resources is usually accounted for by the fact that nowadays organizations are facing such challenges as a need to increase productivity, expand into global markets, develop new technologies, respond to changes in the highly volatile marketplace, increase revenue and decrease costs, develop skilled and flexible workforce, and introduce changes (Burke, 2005), which, of course, emphasizes the significance of human resources and capabilities.

7. IMPLICATIONS AND FUTURE SCOPE

This study is a part of a larger research project exploring SC related practices. The methodology of critical evaluation involved literature review of empirical research articles on performance measurement, SCM and HR practices. The authors' intention is to fill up the gap about the lack of research in supply chain management which investigates the role of critical success factors in manufacturing organizations of India. Furthermore, the study to be carried out resulting from the proposed model is expected to investigate the critical success factors that contribute to the SCM performance in order to increase the competitive advantage of the Indian manufacturing organizations.

The study intends to survey many small and medium manufacturing organizations in and around Dewas, Ujjain, Indore and Pithampur areas of Madhya Pradesh (M.P.) state of India. The implications of our research work would be to benefit the manufacturing organizations to be surveyed in terms of new and customized SC performance approaches, with due consideration to their geographical location and related SC constraints. However, the scope of this study is limited only to Malwa region of M.P. state of India. It can be further extended to cover the entire country.

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