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Contents

DETERMINING THE SPINNING RESERVE IN POWER SYSTEMS BY CORRECTED RECURSIVE PJM METHOD

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Abstract

Security for grids in the electric industry is very important to the power grid system. Dispatching a consistent high quality to customers is the main goal. There is a need for balance in power generation and power consumption.

Consumption forecasts do not meet load amounts and grid system tolerates consumption loads beyond actual amounts to be sure the spinning reserve is necessary not only in order to be secure but also because of need for accurate calculating.

In this research the amount of the Spinning Reserve needed in an instant system using the PJM method will be determined. Then, with an innovative recursive model, optimize and correct the determined spinning reserve.

Keywords

Power system, spinning Reserve, risk, management, security, Copt table

Introduction

Available generation capacity in the system contains the difference of generation and consumption. The adequate spinning reserve is one of the main parameters to supply the security of the power system operation.(Miller, R. 1981). In order to minimize risk in the system, the supply and security of the system is analyzed. To minimize system malfunction, which is caused by unsecured forecast of load and exiting the units out of circuit by accidental event, proper analysis must be done. (Gool, B., Mendes,DP. 1998) There are different methods to determine the reserved power in the system.

- Capacity Outage Probability Table
- Forced outage rate

- Outage replacement rate
- Pennsylvania, New Jersey, Maryland (PJM)
- Large Unit (LU)

In the LU method, capacity of reserved power is being selected according to the largest unit of system capacity.(Fotuhi Firuzabadi, M., Afshar, K. 2003)

In this way: articles for more security are being selected even two times more than the largest unit capacity.(Y.Y.Hsu, Y.Y. Lee, Y., Jien, J.-D.1990) In the LU+PL method the reserved power is being selected by a certain percentage of annual peak load added by the largest unit in the system.(Fotuhi Firuzabadi, M., Afshar, K. 2003) In SCR, the scenario is being defined and the reserved power is selected in order for the system to be able to withstand an accident. The LU and PL+LU methods must all are applicable methods. A particular method for the same size systems with different parameters is determined by a unit criterion exertion that determines the capacity of system reserve. With this, an equal reserve will be achieved.

Stochastic methods are available, in which we can calculate the security ability of a system properties. One of these stochastic methods to calculate the spinning reserve is a method based on the risk calculation. Risk is being estimated by the probability of when the system cannot supply intended load (Billinton, R. Nurul A. Chowdhury, 1988) In this research one of the stochastic methods have been used in order to determine the spinning reserve which is based on the assessing the reliability of the system. This method is being done with the COPT table production and determining the amount of system risk compared with the allowed risk amount. This method is a suitable and flexible one in determining the spinning reserve. The system and it’s allowed risk amount tolerance along with the amount of the spinning reserve is determined.

In order to determine the amount of available risk in the system, software has been defined and a correction has been applied into the PJM method. In the second part of this article, the methods of determining the spinning reserve will be covered. The PJM method will be explained. In the 3rd part the amount of spinning reserve based on the mentioned method by the produced software for an instance grid will be determine. At the 4th part the way of dispatching the spinning reserve onto an instance grid's units will be calculated and presented. The result will be assessed in the 5th part. Finally, in the 6th part the conclusion and suggestion will be presented.

Determining the Spinning Reserve by PJM method and Markova model

For each unit in this model there are 2 states. The unit is working with its highest capacity and it is in the circuit or that is out of function and it is out of circuit, they are UP state (or 0) state and down (or 1) state respectively.(R. Billinton, S. Kumar, N chowdhury, 1989)

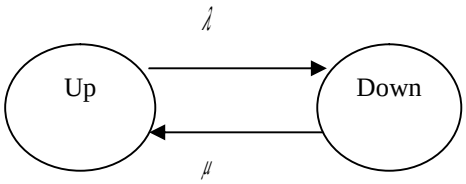


Fig.1: the two states model for a unit

Now according the upper definition the below equation is achievable:

$$P_{down} = \frac{\lambda}{\lambda + \mu} - \frac{\lambda}{\lambda + \mu} e^{-(\mu+\lambda)t} \qquad \textbf{(1)}$$

The general conceptual title for FOR, ORR

FOR represents unintended exit speed ORR represents replacing the exiting objects speed. If the time of the equation in Fig.1 assume to be ∞, Pdown will be posed for programming and called FOR (unintended exit speed) and the Pdown formula turns into the formula below:

$$P_{down} = FOR = \frac{\lambda}{\mu + \lambda} \qquad \textbf{(2)}$$

Pi(t) represents probability of the system to be in position i in time t.

T represents lead time.

λ represents being out of function speed for a generation unit speed

μ represents repairing speed (transition from being out of function into safe)

At the operation time because of none-availability of repairing this amount will be assumed to be zero ($\mu \to 0$) and its name is ORR. The Pdown (or ORR) formula is below.

$$P_{down} = 1 - e^{-\lambda T} \qquad \textbf{(3)}$$

Because of λ is a very small in lead time this abstracted equation is in mind:

$$P_{down} = ORR = \lambda T \qquad \textbf{(4)}$$

Equation 4 is known as ORR and shows the probability of not to replace the out of function unit in the lead time (T).

Determining the spinning reserve power value by Copt table

The first column of output capacity, the second column of capacity in the system, the third column of capacity output probability, and the forth column of total probabilities are the system risk, and in the line where CAP.IN value equals load. The risk amount is obtained as per load and production value. To find total probabilities, forth column, the following formula can also be used.

$$P(X) = (1-U)\, P'(X) = UP'(X-C) \quad \textbf{(5)}$$

$P'(X)$ = assembling probability value

$P(X)$ = assembling probability value (risk)

U =FOR or ORR value

X = output megawatt value

C = last output capacity value in each step

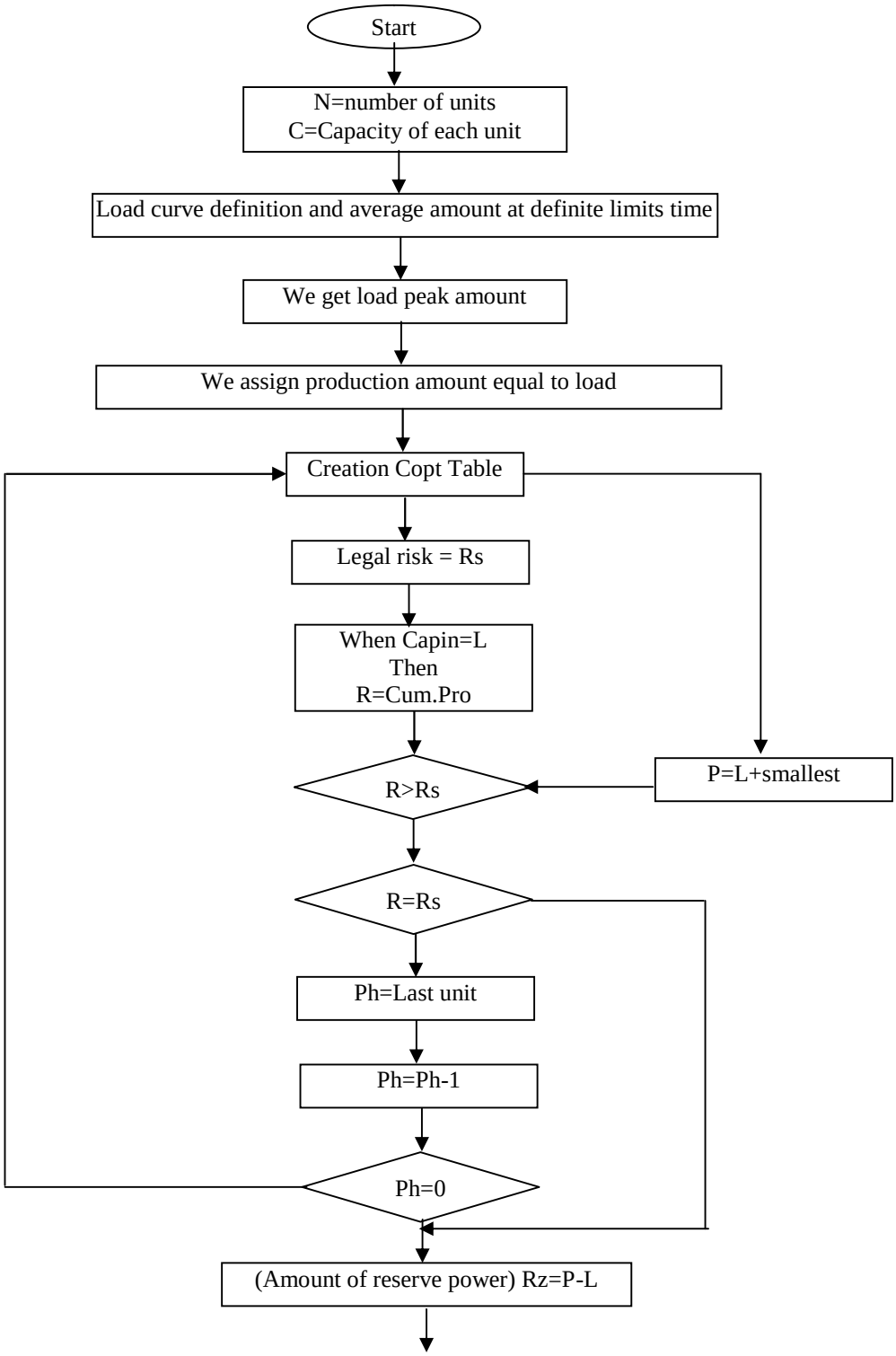
Table 1 COPT models parameter

CAP.OUT	CAP.IN	PROBABILITY	CUM.PRO
A_1	B_1	P_1	$P_1+P_2+P_3+P_4$
A_2	B_2	P_2	$P_2+P_3+P_4$
A_3	B_3	P_3	P_3+P_4
A_4	B_4	P_4	P_4

In the beginning, if output power is $x \leq 0$, then $P'(X)$ will be 1 and if $P'(X)$ is 1 and $x>0$, then $P'(X$ will be 0. If $x=0$, then $P'(X)$ is one and if $x>0$, $P(X)$ from previous stage will be replaced with $P'(X)$, and if there is no X from previous stage, $P'(X)$ will be 0. (R. Billinton, R. N. Allan,1996)

The suggested algorithm for determining reserve power amount

Since the obtained risk value may be too much, the largest unit output is calculated with software until the risk is reduced to a manageable level The flow table of applied algorithm is shown below:



End

Figure 2-The suggested algorithm for determining the reserve power amount is found by applying Copt table

Assimilation of sample network

The existing sample network shows a confidence capacity test (RTS) in IEEE the single line diagram is shown in figure 3. The system has 2(PV) generator bases, four (PQ) load bases, 9 transferring lines, and 11 production units. The least producing unit is 5MW and the most one is 40MW. The voltage level of system transfer lines in 230 KV and voltage changes is between 0.97-1.05PU. The most load system is 185MW, and the production installed capacity is 240MW. The other features are as follows:

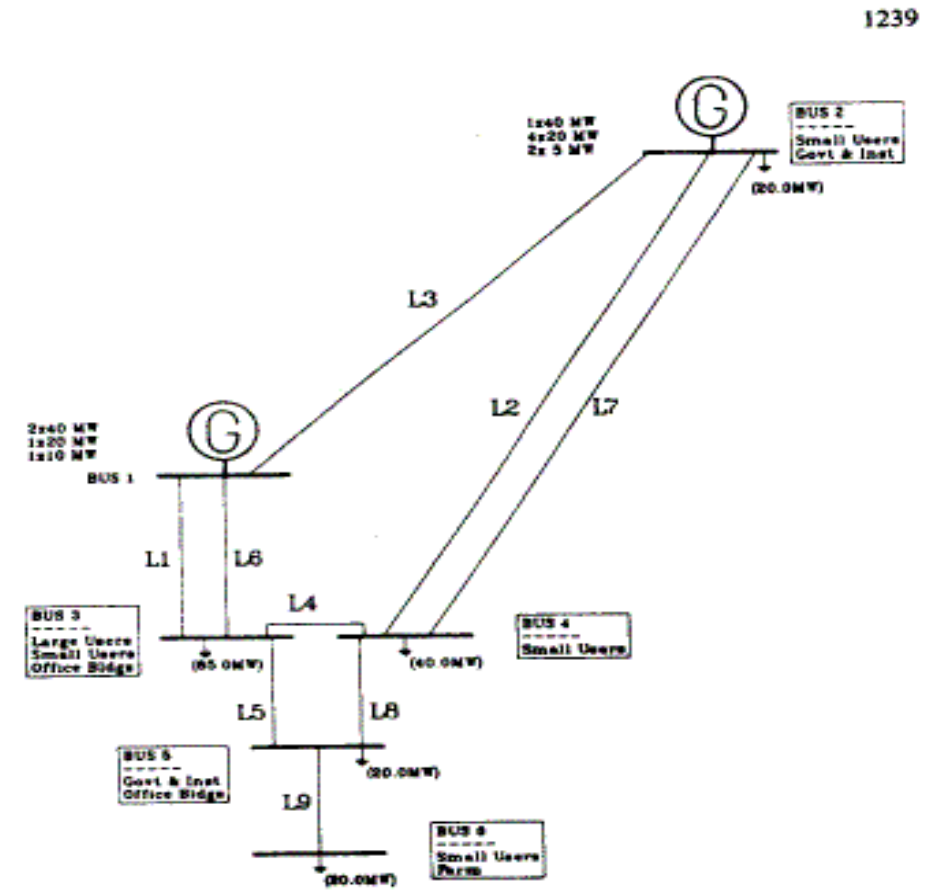


Figure 3- single line diagram of sample network

Table 2- destruction rate of sample network units

Destruction rate per year	**Obligation destruction rate**	**Number of each unit**	**Type**	**Unit size (MW)**
2	0.010	2	Aqueous	5
4	0.020	1	Thermal	10
2.4	0.015	4	Aqueous	20
5	0.025	1	Thermal	20
3	0.020	1	Aqueous	40
6	0.030	2	Thermal	40

$$\lambda = \frac{\text{Destruction rate per year}}{8760}$$

Risk amount as per production

The more the production, the less the risk. Figure 4 shows network risk versus production value. Copt table of productions from which the diagram numbers are extracted, are calculated by software, and the amount of proper production per

allowable risk (Y.Y.Hsu, Y.Y. Lee, Y., Jien, J.-D. 1990) is 230 MW. By applying suggested method in this article with proper confidence capacity, the optimum calculated reserve power is reduced to 225 MW.

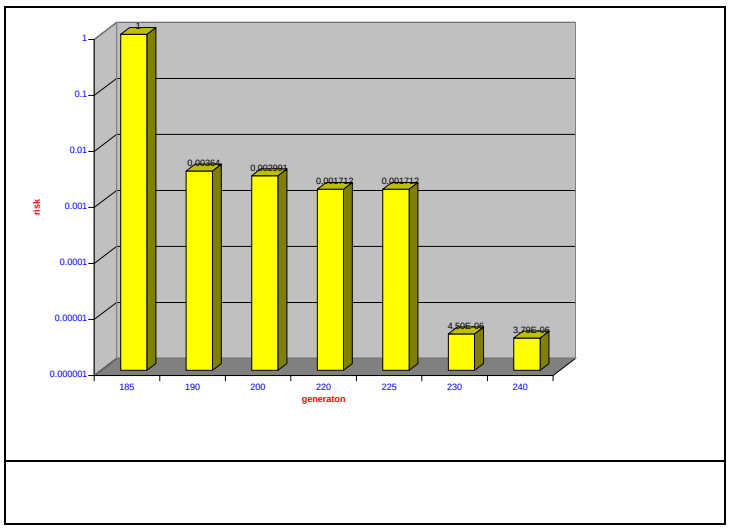


Figure 4- Risk amount as per production

Determining reserve power value as per risk

By changing the figurative risk amount of the system, we may consider various reserves for the system. These take into account the circumstances and destruction reply rate of sample network units according to values in table 4. The different values are shown in figure 5.

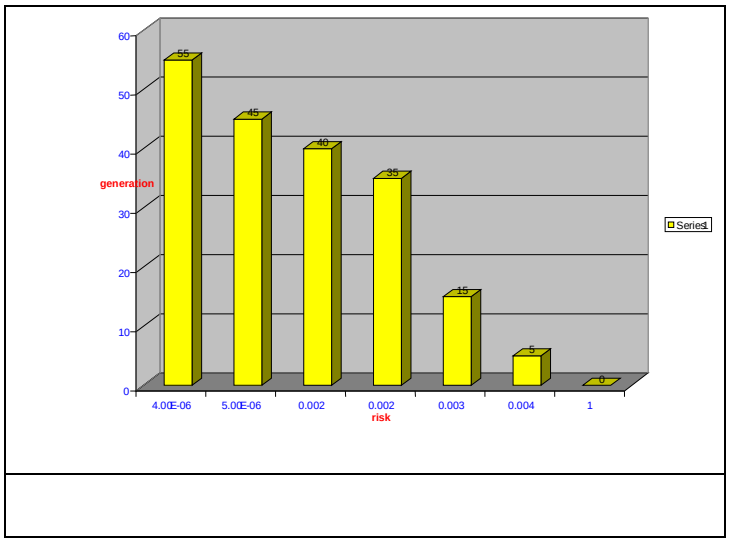


Figure 5- Reserve power value as per risk

The method of distributing spinning reserve power in the system

Here, the amount of production led those results in proper risk for the system is considered. Considering 185 MW loads on the system, input and output figures are shown below in Table 3. The empty capacity remained for the system and the reserve amount was found. The reserve amount on each unit is also obtained as per reply rate of each unit. Finally, the most proper reserving distribution is the one that presents more reserve amount and less rely risk.

Table 3- Copt table for 185 MW

Cumulative	**In**	**Out**
1	185	0
0.002918	180	5
0.002691	165	20
0.001028	160	25
0.001028	145	40
2.18E-06	140	45
1.94E-06	125	60

2.36E-07	120	65
2.35E-07	105	80
4.44E-10	100	85
3.91E-10	85	100
3.41E-13	80	105
2.52E-13	65	120
1.37E-16	60	125
7.95E-17	45	140
3.04E-20	40	145
1.23E-20	25	160
3.56E-24	20	165
7.54E-25	5	180
1.72E-28	0	185

Table 4- Destruction reply rate of sample network units

MW/min reply rate	**Destruction probability with in 5 minutes**	**Number of units**	**MW**
20	0.0000190	2	5 (hyd.)
1	0.0000381	1	10 (th.)
20	0.0000228	4	20 (hyd.)
1	0.0000476	1	20 (th.)
20	0.0000285	1	40 (hyd.)
1	0.0000571	2	40 (th.)

$$\text{Destruction possibility Within 5 minutes} = \frac{5 \times \lambda}{8760 \times 60}$$

Examination of the results

To achieve proper confidence capacity and not have more reserve than necessary, 225MW production was found to be optimal in this research (40 MW of which is for reserve power). This method delivers efficient value for reserve in the network compared to other methods. It also supplies system confidence capacity and prevents extra reserve amounts in the system resulting in revenue expense increases. The method of distributing reserve power into the sample network is suggested in the appendix. It should be mentioned that the proper reserve distribution is the one that

gives more required reserve amount with better reply risk. Table (5) is the most proper reserve power distribution for a sample network.

Conclusion

As it was seen, spinning reserve power value was calculated by a probability method. .The spinning reserve power amount was found by PJM method. Then, regarding the fact that reserve power amount should not be surplus in the system, software is employed is obtained to obtain optimal system values.

Regarding the advantages of this method, it is suggested that such a method is used for determining spinning reserve power amount of system in long term planning. It can also be applied in daily examinations of power capacity and output that maintains optimal system operation.

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Appendix

The tables (5) to (9) on appendix show distribution of spinning reserve on sample network units.

L: Load in island system,

$G_{i:}$ Total capacity of system in situation i,

R: Reserve

	(hyd.)	(hyd.)	(hyd.)	(hyd.)	(hyd.)	(hyd.)	(th.)	(hyd.)	(th.)	(th.)
G	(hyd.)	(hyd.)	(hyd.)	(hyd.)	(hyd.)	(hyd.)	(th.)	(hyd.)	(th.)	(th.)
G	(hyd.)	(hyd.)	(hyd.)	(hyd.)	(hyd.)	(hyd.)	(th.)	(hyd.)	(th.)	(th.)
G	(hyd.)	(hyd.)	(hyd.)	(hyd.)	(hyd.)	(hyd.)	(th.)	(hyd.)	(th.)	(th.)
L	(hyd.)	(hyd.)	(hyd.)	(hyd.)	(hyd.)	(hyd.)	(th.)	(hyd.)	(th.)	(th.)
R	0	0	20	20	20	20	20	40	40	35
G	5	5	20	20	20	20	20	40	40	35
L	0	0	20	20	20	20	20	40	40	0
R	5	5	0	20	20	20	0	40	40	35
L	0	5	0	0	0	0	0	0	0	5
R	0	0	20	0	0	0	5	0	0	0

USING DESIGN PATTERNS, ANALYSIS PATTERNS AND CASE-BASED REASONING TO IMPROVE INFORMATION MODELING AND METHOD ENGINEERING IN SYSTEMS DEVELOPMENT

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Bonnie W. Morris, West Virginia University

Abstract

Information modeling (IM) is the process of identifying information needs and models based on user requirements and systems analysts' perceptions during systems analysis and design. When IM is done correctly, it facilitates communication between the analysts and end-users about the final software product. In addition, successful IM provides a formal basis for both the analysts and the end-users about the tools and techniques that will be used in software development (SD), which, in turn, reduces costly overruns in time and money during systems implementation. *Method engineering* (ME) is the process of designing, constructing, and adapting information modeling methods for information systems development. As Siau (2003) and Kavakli (2005) point out that, while there has been a steady increase in IM and ME research (e.g. Kawalek & Wastell 2003, Kavakli 2005, Matulevicius 2005), most of the models reported in recent literature are still primarily based on common sense approach, and, as a result, lack a slid theoretical foundation.

This paper discusses the feasibility of combining design patterns (DPs), analysis patterns (APs) and case-based reasoning (CBR) to improve information modeling and method engineering. Recent research in DP, AP, and CBR has proven that all those methods are effective in software development. In this paper, we propose a model that combines DP, AP and CBR as a tool to improve IM and ME. We believe that the use of DP and AP, along with CBR will facilitate easier communication among systems analysts, end-users and software engineers thus improve on he efficiency in software development. In the paper, we also provide illustrative examples from accounting systems design to show the effectiveness of our proposed model. Finally, we provide evidence in this paper that the practical application of DPs, APs and CBR to systems development makes it possible to identify and resolve critical issues and risks at earlier stages in IM and ME, and eventually lead to high quality end product.

Keywords

design patterns (DP), analysis patterns (AP), case-based reasoning (CBR), information modeling (IM), method engineering (ME), software development (SD)

INTRODUCTION

Information modeling (IM) is the process of identifying information needs and models based on user requirements and systems analysts' perceptions about the information needs during systems

analysis and design1. It is the most important step in information systems analysis and design (Siau 2003). When IM is done properly, it generates models that bridge the gaps of understanding in systems requirements between the analysts and the end-users (Siau & Rossi 2001). Furthermore, sound IM provides information models that facilitate systems implementation in terms of adequate level of resource allocation and proper use of system tools and techniques. Therefore, a solid IM ensures a successful systems project.

Method engineering (ME) is the process of designing, constructing, and adapting information modeling methods for information systems development (Siau 2003). The development of information systems is a complex task. To help manage the complexity of the system development process, designers, analysts and programmers have developed a vast array of ME tools and methodologies. For example, CASE and Unified Modeling Language (UML) are tools to aid in design and implementation (Booch et. al. 1998 &1999, Siau & Cao 2003, Whittle 2003). These and other tools are intended to lead to well managed, well written applications, developed within budget, and delivered on time.

Ultimately, however, success of an information system is determined by how well it meets the user's needs. No matter how elegant the code, or how quickly and efficiently it was developed, a system that does not meet the users needs is a failure. As Cunningham (Fowler 1997, p. 7) states,

"We already have in our hands the machinery to build great programs.
When we fail, we fail because we lack experience."

Cunningham refers to the analyst's lack of domain experience in the information modeling (IM) and method engineering (ME) processes. Analysts who have been involved in the

1 Kavakli & Loucopoulos (2005) called such processes *Requirements Engineering* (RE), although the content, methods and examples of RE used in their paper are essentially the same as *Information Modeling* defined in Siau (2003). Likewise, Gjersvik et al. (2005) called the process *Enterprise Process Modeling* (EPM). Again, in this paper, we view EPM interchangeable with the process of *Information Modeling*.

development of a similar system can do a better job of eliciting user requirements in IM thus can design a system that better meets the users' needs because they already have developed better information models. During ME, they know about the key components and their interactions, about possible special cases and exceptions that users might fail to mention, and perhaps about design features that have failed in the past.

Knowing the importance of IM and ME in successful systems project, this paper discusses the feasibility and usefulness of incorporating analysis patterns (APs) and design patterns (DPs) into a case-based reasoning (CBR) system to support user-analyst communication in the IM and ME processes. As Siau (2003) and Kavakli (2005) point out that, while there has been a steady increase in IM and ME research (e.g. Kawalek & Wastell 2003, Kavakli 2005, Matulevicius 2005), most of the models reported in recent literature are still primarily based on common sense approach, and, as a result, lack a slid theoretical foundation. Therefore, we are motivated to propose a model that will provide a theoretical foundation that supports IM and ME. We will also provide several examples from accounting-based systems design to illustrate how our proposed model works in soliciting information models to facilitate systems implementation.

The remainder of the paper is organized in the following fashion: The next section discusses the current state of information modeling and method engineering and existing problems. Section 3 introduces our proposed model that applies design patterns (DPs) and analysis patterns (APs) in a case-based reasoning (CBR) setting. Section 4 provides the conceptual background of CBR, DP, and AP. Section 5 illustrates how our proposed model works in several systems design examples. And, finally in Section 6, we provide the conclusion and future direction of the research in patterns and CBR.

Information modeling and method engineering – CURRENT STATUS

One of the first and most important steps in system development is the system requirements analysis task. Effective analysis is required to ensure that designers have correctly defined the business problem and are developing an appropriate solution.

An earlier report on systems development that has been widely quoted is the CHOAS Chronicles research report by the Standish Group (1995). The Standish Group found that only 16% of all large system development projects were delivered on time and on budget, while 31% of all projects were canceled before completion. The average cost overrun was 189% and the average time overrun was 222%. Lack of effective user involvement and incomplete or ineffective systems analysis were cited as the top two factors leading to system failure. Nearly a decade later, the Standish Group (2003) reported similar results about systems development: among all systems projects, 34% of projects were successfully completed, 15% projects were total failures, while the remaining 51% are still "challenged" projects.2

Cushing & Romney (1997) reports the following four basic strategies for improving information modeling:

1. Asking users,
2. Analyzing the existing system,
3. Analyzing usage of the existing system, and
4. Experimentation.

Two factors that contribute to the effectiveness of each method are user experience and analyst experience. Users who lack experience with the current system and with the system

2 Although Standish Group reports on successful as well as failed systems analysis and development, in this paper, we view the process leading to successful systems analysis as a part of information modeling and method engineering.

development process are oftentimes less effective in specifying information models. Lack of specific problem domain experience also limits the effectiveness of the analyst in successfully applying method engineering to solicit user requirements (Cushing & Romney 1997, Siau & Rossi 1998). General system development experience does not seem to compensate for lack of domain experience.

Another problem system designer's face is that users may have difficulty distinguishing between reality (i.e., the actual business requirements which should be derived from organizational strategy) and the existing model of reality (i.e., the current information system). This leads to a tendency by users to describe the current needs in terms of "how we've always done it" rather than "how it should be." Proper IM should reflect current business needs. The existing system is merely an artifact or model of the business needs at a previous point in time. That artifact may reflect design compromises that resulted from hardware, software or other implementation constraints that are no longer valid information models in the present implementation.

Although development methodologies (e.g. Gjersvik et al. 2005) and textbooks (e.g. Cushing & Romney 1997) stress the importance of user involvement, in many cases, the user plays a very passive role. Users are viewed as repositories of information from which the analysts must extract, elicit or pull the information models through method engineering by conducting interviews, surveys, and observation of the existing system. The focus is on determining how the current system operates and its perceived weaknesses. The responsibility for conceptual design falls largely to the analyst. And, if the analyst lacks the experience in IM and ME, the developed systems tend to fail due to insufficient IM and inadequate ME.

Problems associated with the traditional method in IM and ME can be summarized in the following chart.

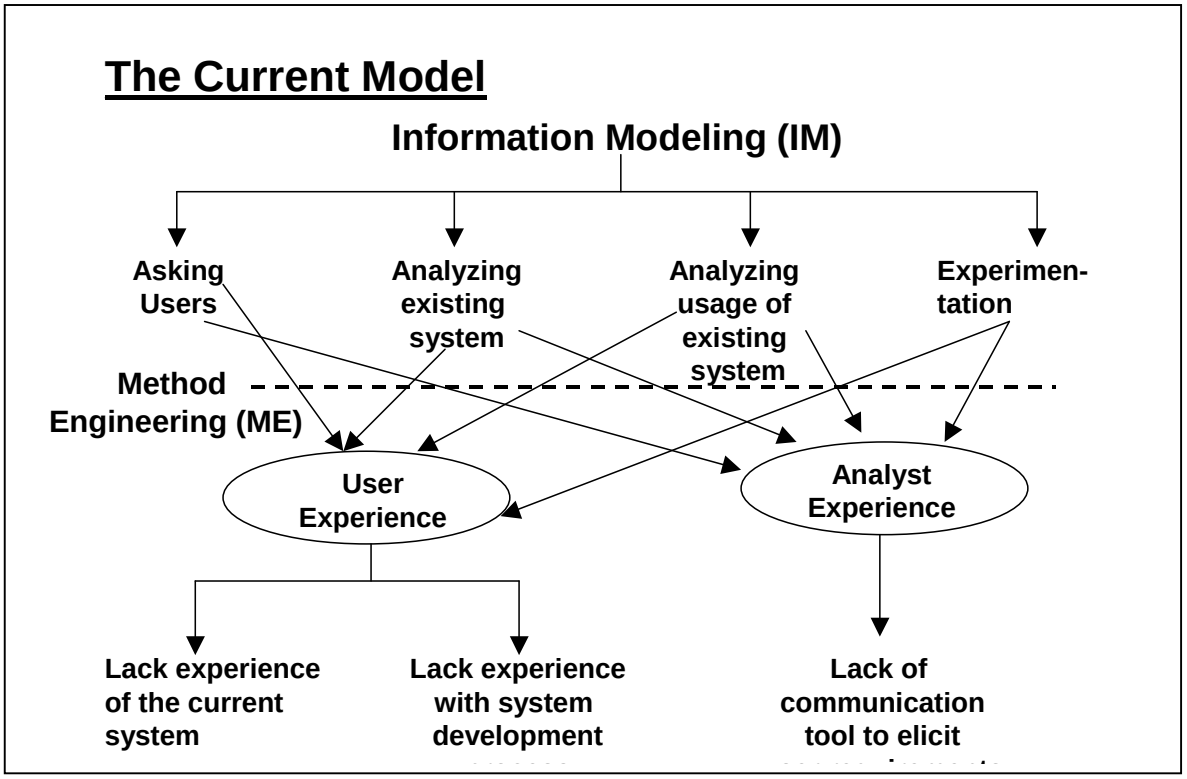


Chart 1: Information Modeling – The Current Model Applying DP and ap in a case-based reasoning setting

This research is motivated by the desire to improve communication between the user and the analyst in IM, and to provide the user with tools that will help compensate for lack of development experience in ME. We believe that the adaptation of design patterns (DPs) and analysis patterns (APs) in a case-based reasoning (CBR) setting will improve communication between the user and the analysts thus generate better information models. Our proposed model will also facilitate the solicitation and construction of information models thus improves the quality of ME. We will elaborate on how our proposed model works in the following:

Case-based reasoning (CBR) is reasoning by analogy to past cases or experiences. Humans utilize CBR in many aspects of their lives. Reasoning from past experience is a strategy that humans use for reducing cognitive load. It is much easier to recall a similar past case and adapt its

solution to solve a current problem than to reason "from scratch" for each new situation (Riesbeck & Schank 1989).

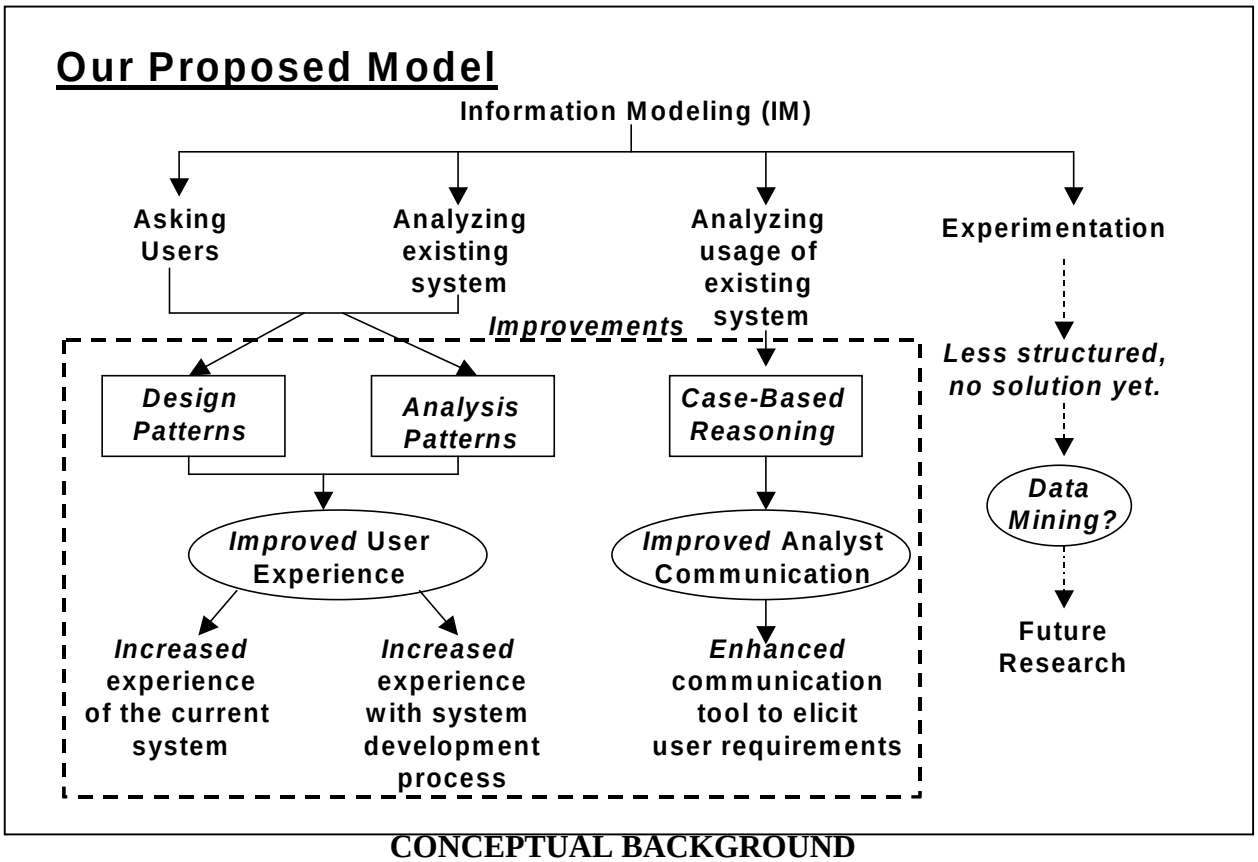
To compensate for the lack of experience, analysts, designers and programmers have begun creating Design Patterns (DP) (Gamma et al. 1995). DP is small, reusable chunks of program code that address recurring design problems. Naming and cataloging patterns provide a way for analysts and designers to communicate with the programmers during information modeling. Therefore, DP can be used to support system implementation.

Another type of pattern is referred to as analysis patterns (APs) (Fowler 1997). APs are developed business cases based on past experiences. They reflect recurring business process patterns, such as the “resource allocation pattern.” Fowler’s work on analysis patterns supports the work of the analyst during IM. AP can be used as a tool in ME that facilitates communication between analysts and designers after information models have been obtained from the user.

IM and ME are important steps in determining system requirement in software development. It is an area that is presently not directly addressed by APs and DPs. Better information models derived from better method engineering improve communication between the user and the analyst, which, in turn, lead to better system development. Communication between the analyst and user is hindered not only by the analyst's lack of domain experience, but also by the users' lack of development experience (Siau 2003). Users may participate in only a few development projects throughout their careers. Often, their involvement is rather passive and provides them with little understanding of the conceptual design process or the potential role they should play. Furthermore, even though occasionally users may have great depth of understanding about their organization's existing systems, they may still lack knowledge about alternative ways that similar applications

have been implemented in other organizations. Knowledge and experience with alternative implementations may aid business process reengineering efforts.

APs and DPs are specific instances of CBR that supplement the experience of analysts, designers, and programmers. The proposed CBR system discussed in this paper will extend the Analysis Pattern-Design Pattern paradigm by providing support for user-analyst communication during IM and ME processes.



CONCEPTUAL BACKGROUND

Case-Based Reasoning (CBR)

CBR is a problem-solving approach using memory of previous problem solving cases. CBR approach relies on analogy. It is often used in task domains that have no strong theoretical model and where the domain rules are incomplete, poorly defined and inconsistent (Ashley and Rissland 1987, 1988; Kolodner 1993). With CBR, problems are solved not by finding and applying the

knowledge of the most appropriate fundamental principles, but by finding and applying the knowledge of the most relevant and similar prior cases (Mukhopadhyay et al.1992).

Auditors regularly use prior cases in their financial judgments (Friedman 1995), particularly when they need to consult their national offices for information (Danos et al. 1989, Salterio, 1994). Salterio (1996) calls these prior cases "precedents", and defines them as "…prior examples of similar situations encountered in the firm's practice, documented in internal memorandum or by other audit firms as seen in the published financial statements disclosures…" It is known that Big Four firms encourage staff to search for relevant precedents before field work (Danos et al. 1989, Salterio 1994 & 1996). In this paper, we will use examples from auditing to show how our proposed model works in IM and ME.

A staff auditor who is assigned to audit a construction company, bank, or real estate holding company can retrieve a related precedent case to learn how business is conducted in that industry. The case may contain information about the industry's critical success factors, difficult accounting issues, areas of potential risk for errors or irregularities, and sample financial disclosures. The precedent cases provide the auditor with a mental model of business practices in the client industry. The precedent can be used as a standard against which the new client's business practices can be compared and contrasted. Providing precedents is one of the major services that the Big Five national offices offer to practicing auditors to enforce a consistent corporate policy (Cushing & Loebbecke 1986; Gibbins & Mason 1988).

Recently accounting, finance and IS research has shown considerable interest in developing CBR systems to support IM (Denna et al. 1992, Jung et al. 1999, Ku et al. 1996, Lee & Han 1998, Morris 1994, Rockwell & McCarthy 1999, Sinha & Richardson 1996). As a computational model, CBR has also been used as a tool for ME when it is applied to various other relevant domains such

as engineering design (Maher & de Silva Garza 1997, Kohno et al. 1997), law (Ashley 1991, Ashley & Rissland 1988), and software control (Mukhopadhyay et al. 1992).

Past cases can be used to provide a pattern for a solution to a similar problem, to remind one of past failures, to set expectations about missing or tacit information, and to help explain or justify one's decisions (Morris 1994). For complex design problems, it is easier to adapt an existing successful design than to create a new design "from scratch." The past design has been tested and its strengths and weaknesses identified. The difficult task of combining and integrating multiple components has been solved. The user and designer can spend their time more productively adapting a useable design to generate information models that will fit the current needs better.

Cases, patterns, and examples are all tools that can be used to improve communication in Method Engineering. Sometimes individuals who have a shared experience will name the experience and then use that name as a shorthand way to communicate about the events that occurred. For example, when the speaker mentions an event such as "the New Year's Eve party at Stan's", the listener will be reminded of the who was there, what foods were served, and the fact that the host became ill and went to bed at 10 p.m.

To further illustrate the effectiveness of using past cases or patterns for communication, consider the situation where a family decides to build a new home. The family has the following three alternatives ways of communicating their requirements to the architect/builder:

1. To enumerate all the features they want,
2. To describe their current home and explain how they want the new home design to differ from the existing one, or
3. To search pattern books to find a floor plan that is similar to what they want to build.

We will discuss the aforementioned three alternatives in more details in below:

Alternative 1:

Giving the architect/builder a list of requirements (i.e. information models) shifts the responsibility for the design from the owner to architect. This is a common approach for commercial buildings, but is not widely used for individual homes because it is a very expensive method. If the family wants something that is unique or designed by a famous architect, they may be willing to pay a premium. When the Kaufman family engaged Frank Lloyd Wright to build *Fallingwater*, they were buying a Frank Lloyd Wright design. Under this approach, the homebuyers give the architect a general description of the features they want. Through subsequent interviews and an iterative process of design reviews (i.e. the process of information modeling), the architect learns how the family intends to use the home and refines the initial requirements list. This method requires a significant amount of buyer-designer interaction to refine the user requirements via an iterative process – i.e. the method engineering (ME) process. In system development, as well as home building, this is a costly approach.

Alternative 2:

As an alternative, prospective homeowners could begin by describing their current home as information models and explaining how the home they want to build differs. This is the approach that is often taken in software requirements analysis. Users are asked to describe the current system, identifying its good features and its weaknesses or deficiencies.

In software development as well as home building, the desired changes from the existing design are likely to be significant - otherwise, why build a new one? The existing home (or system) reflects budgetary and time constraints that were present when it was built or purchased. Those are

likely to have changed over time. Also, the homebuyers' needs are likely to have changed as well. They may have more children, (or fewer children), an elderly parent, or some change in physical condition that requires a special design. As the extent of differences in the constraints and requirements increases, the usefulness of the existing plan (information model) as a communication mechanism decreases.

In fact, starting with the existing software may be somewhat dysfunctional due to the anchoring and adjustment bias. By anchoring on the existing system, it will be more difficult to conceive of and make major changes, thus hindering reengineering efforts.

Alternative 3:

The third alternative - searching plan books - is an intuitively appealing approach, and it the most common approach used. Plan books containing floor plans and front elevations (information models) are arranged by type of dwelling (e.g., ranch, multi-level) and by size and style (e.g., southwest, colonial) to make the search easier. The homebuyers can browse through the plans to get new ideas. They can compare and contrast designs and weigh the pros and cons of design alternatives (method engineering). When they find a plan that has most of the features they want (better information models), they take it to a designer to make modifications (method engineering). The plan selected by the homebuyers is rich details that would be difficult to communicate otherwise.

More importantly, detailed architectural renderings including mechanical drawings for heating, wiring and plumbing can be purchased for the plan selected. This means that the designer can begin with a tested design that combines and integrates multiple components. The homebuyer and designer can spend their time more productively adapting a tested design than trying to generate one from scratch.

Architectural, engineering and systems design are tasks that lack strong domain models and require effective communication between the buyers/users and the designers. CBR has been used to improve communication and support the design process for architectural and engineering systems and is likely to be useful for the systems development task as well.

Design Patterns

The concept of design patterns (DPs) in software engineering is often said to originate from the architectural works of Alexander et al. (1977) and Alexander (1979), in which the authors suggest that many beautiful commercial structures are not simply the result of creative architects. Rather, the designs evolved as the architects in the region copied and modified the successful designs of others to address local design problems such as climate and terrain. Alexander et al. (1979) began to recognize recurring patterns in architecture around the 1960s. With those recognized patterns, they were able to provide solutions to different architectural design problems in the form of fixed patterns. Even novice architects who desire to design buildings by themselves could use these patterns.

Alexander (1979) and Alexander et al. (1977) describe patterns and features that are derived from well-regarded architectural designs in the form of design problems and their solutions. Each solution provides relationships needed to solve a designated problem in both general and abstract fashions. By adapting a particular design that had been used to solve previous problems, lay architects were able to sketch novel designs that fulfill their preferences and meet local conditions in the place where the new structure is located. With 253 patterns included in Alexander (1979), a novice architect could create nearly infinite combinations of architectural designs. Furthermore, Alexander argues that patterns are well-researched solutions to recurring design problems. He also asserts that designs that violate the derived patterns were noticeably less successful than those that followed them.

Over the last decade, as object-oriented design has gained acceptance as a good technology for software development, people from the software community discovered Alexander's concept of pattern language. Although software design is seemingly a different domain from architectural design, researchers in software engineering (e.g. Eden & Hirsheld 1999, Eden & Yehudai 1999, Gamma et al. 1995, Keller et al. 1999) have found it helpful to have an abstract method, similar to that of Alexander's pattern language, to express the core solutions and the rationale behind software system designs.

Gamma et al. (1995, 3) define design patterns as "descriptions of communicating objects and classes that are customized to solve a general design problem in a particular context." They name and identify key aspects of a common design structure such as "factory method pattern" or "singleton pattern," and provide a good way for creating a reusable object-oriented design. In addition, they also assist a software engineer in the maintenance of software product, modification of existing programs, removal of programming bugs, and addition of new features.

DPs are usually not invented; instead experienced software engineers and programmers derive them empirically from observations. Therefore, the use of DP ensures the successful application by other programmers in different situations. DPs are core solutions to recurring problems in software implementation. They capture both static and dynamic structures and collaborations of components in successful solutions to problems, and give software engineers an easier way to communicate designs on a higher level of abstraction. Otherwise, for each new design, the designers have to think in terms of individual classes and their behaviors.

According to Agerbo (1998), when compared with traditional software designs, the application of DPs in software development has the following advantages:

1. They encapsulate experience.

2. They provide a common way for software developers to communicate with each other

3. They enhance the documentation of software designs.

Gamma et al. (1995) describe a DP as including the following elements: *pattern name, intent, motivation, applicability, structure, participant, collaboration, consequence, implementation, sample code, known uses, and related patterns*. These elements provide information such as where to apply the pattern, how to use it, and what the results will be, etc. Table 1 below explains each element in more detail:

Elements	Function
Intent or pu	A short statement that explains: what does the design pattern do? What is its rational and intent? What particular design issue or problem does it address?
Motivation	A scenario that illustrates a design problem and how the structure of class and object in the pattern solve the problem.
Applicabilit	A list of situations that includes when the design pattern can be applied, examples of poor designs that the pattern can address, and how the user can recognize these situations.
Structure	A graphical presentation of the classes in the pattern by a notation on OMT (Object Modeling Technique).
Participants	A list of classes and/or objects that participate in the design pattern and their responsibilities.
Collaboratio	A description that explains how the participants collaborate in order to carry out their responsibilities.
Consequenc	An explanation of how the pattern supports its objectives, what are the trade-offs and results of using the pattern, and what aspects of the system structure that may change independently.
Implementa	A list of descriptions about pitfalls, hints, or techniques that could cause problems when implementing the pattern, as well as other language-specific issues.
Sample Cod	An illustration of how to implement the pattern in C++, Java, or Sma
Known Uses	An introduction of where to successfully use the pattern in specific s
Related Patt	A list of related design patterns and their differences.

Table 1: **Elements in a Design Pattern (Gamma, et al. 1995)**

Design patterns represent a form of case-based reasoning in IM that supports the communication between designers and programmers.

Analysis Patterns

Analysis patterns (APs) differ from DPs. APs represent the conceptual structures of *business processes* rather than actual *software implementations* (Fowler 1997, p. xv). Analysis patterns are intended to reflect the way people think about business activities rather than the way a computer system is designed. As with DPs, APs are derived from experience, not from an academic exercise.

Fowler provides a catalog of APs divided into the following categories: *trading, measurement, accounting,* and *organizational relationships*. APs are groups of concepts that represent a common construction in business modeling (Fowler 1997, p. 8). Examples of accounting APs are: *account* and *entry, transactions, summary account, posting rules, booking entries to multiple accounts*. Each pattern is discussed in terms of one or more actual contexts or business scenarios in which it was originally used.

For many patterns, Fowler includes alternative designs together with a discussion of the strengths and weaknesses of each. For example, under the topic of transactions, he discusses two-legged vs. multi-legged transactions. Two-legged transactions are ones in which there are exactly two accounts involved (equal amounts are always debited and credited). Multi-legged transactions can involve more than two accounts with the constraint that the sum of the debits equals the sum of the credits3. As Fowler notes, although there may be business situations where all transactions are only two-legged, such as tracking the movement of goods from the receiving dock to the warehouse, using a multi-legged construction is more general, and provides greater flexibility to

3 Fowler avoids the words “debit” and “credit.” His concepts are intended to be more abstract and not related specifically to actual accounting and inventory contexts. For example, such transactions could also be used to track the movement of evidence in legal proceedings. Furthermore, his audience is software designers, not accountants.

accommodate future changes. Inclusion of alternatives and an assessment of the pros and cons of each within the context of a specific problem enhances the usefulness of the pattern approach.

Analysis Patterns are not mere extensions of the DP. DP represent small components of code. AP represent small chunks of business processes. AP sometimes make use of established DP. For example, Fowler's (1997) accounting patterns utilize Gamma, et al., (1995) *iterator*, *singleton*, and *strategy* patterns.

Fowler's patterns are based on an object-oriented model. Hay (1995) also discusses similar conceptual business process patterns using a relational data modeling style.

Analysis patterns are a form of case based reasoning that supports the conceptual design process and communication among design team members.

THE PROPOSED MODEL – Illustrations of How the Proposed model works

Case based reasoning approaches are available for the conversion of requirements into a conceptual design (APs) and for conversion of the design into code (DPs), but not for determining system requirements. This section examines the feasibility and usefulness of such a system. It should be noted that the proposed system need not be a computational model. Fowler (1997) presented his catalog of patterns as a hard copy book.

This section is divided into two parts. Section 5.1. describes a design problem. Section 5.2. describes how a case could be structured to support the analysis and design process and illustrates its use with the design problem from section 5.1.

Design Problem

Consider the design problem described in Table 2. The objective is to design a system to support work of energy brokers.

Case scenario:

As a result of energy deregulation in the USA, companies are forced to shop for electricity and natural gas. Shopping for electricity can be quite difficult. Different suppliers have different pricing schemes. Prices may vary with the peak demand, as measured over fifteen minute intervals—a single spike in a single fifteen minute period may increase the rate multiplier under many pricing plans. The best prices are for those customers who have smooth demand over long blocks of time. The contracts offered by the power providers vary in length. The process is further complicated by "shopping credits" and "price-to-compare" numbers provided by power providers under mandates from their Public Utility Commissions to facilitate the transition from a regulated to a deregulated environment.

Because of the complexity of the calculations involved in comparing utility contracts, many organizations turn to energy brokers or consultants. Some work for a flat fee. Some charge by the number of kilowatt hours used by the client. Others are aggregators who accept customers who can contribute to a smooth demand and thus qualify for lower kilowatt hour charges and they split the savings with the customer. This client currently charges by the kilowatt hour used.

The job of the broker/agent is to match the customer with the electric service provider that provides the "best" deal. To do this, the broker/agent obtains a billing

history of electricity usage from the customer or from the customer's current provider. Billing histories obtained from the utilities are preferable because they can be obtained in an electronic format and therefore do not need to be re-keyed. Unfortunately, the data format varies from one utility to another. The broker/agents calculate the cost of providing electricity to the customer under the various rate options available from the electricity service providers, taking into account shopping credits, price-to-compare and available contract length.
System Objective: To develop a system to support the work of the energy brokers

Table 2 - Energy Broker Case Narrative

This is a good case to illustrate the usefulness of a CBR approach. Energy Broker is a new business model for the electric industry. There was no need for broker/agents in a regulated world. If employees and management of the broker/agent firms were previously employees of a regulated utility, they may not be familiar with alternative broker/agent models. Because this is a new business model, they also may not have a good understanding of how the business is likely to evolve. If the system analysts/designers also lack prior experience with broker/agent systems, the SRA task will be even more difficult.

Case Structure and Examples

A case based approach requires a set of past cases, an indexing scheme for storage and retrieval, and a mechanism for determining similarity of cases. In domains where there are a large number of cases, case indices can be derived computationally using rule induction or other data mining or classification techniques. In problem domains such as systems analysis, the indexing scheme will evolve as cases are added. When a new case is added, a subcategory can be created if

the new case solution is sufficiently different from the previous cases. Similarly, case categories can be collapsed if the solutions in two categories are very similar.

Indexing should be broadly defined and should be related to the attributes that have the greatest impact on the system design. Manufacturers, wholesalers, retailers, and service organizations conduct business in very different ways. Consequently their information systems needs are quite different. Therefore, organization type is an important index. "Manufacturer" is probably too broad a category. More specific indexes based on the nature of the product (commodity or differentiated), the production processes (continuous or batch), or other factors that affect the information system design may be needed. Similarly, the "service" category can be further indexed into organizations such as accounting firms, engineering firms and attorneys who charge by the hour and broker/agents, such as real estate agents and investment managers who charge based on completed transactions. Refinement of the indexes can take place as additional cases are added to the database.

In most CBR systems, indexing and similarity metrics are devised to retrieve a single case that is most similar to the current case. For the SRA task, it is not as important to select a single case as an analog. In fact, it is more desirable to retrieve several past cases in order to generate many alternative designs. In medical diagnosis, research has found that "early closure," i.e., the failure to consider sufficient alternative diagnoses, leads to poor outcomes. In a similar way, failure to consider alternative designs may adversely affect the development process.

For the purposes of illustration, assume that we have a CBR system with two broker/agent cases. The first is an Investment Management system and the second is a Web-based Freight broker.

First, the Investment Management system will be used to illustrate what comprises a case and how the CBR system could be used to aid in system development. The case is from Carmichael (1998). It is based on an actual experience rather than a textbook model. One part of the case record includes a narrative description as shown in Table 3 (although, in greater detail).

Case description:

The client is an Investment Management firm with several regional offices. The regional offices have Investment Managers who manage client portfolios. Actual contact with the client is done by separate Relationship Managers. The Investment Managers learn of investment opportunities from their internal Investment Department. For some clients, the Investment Manager is authorized to make trades directly. For other clients, the Investment Manager makes recommendations and the firm trades for the account only when authorization is received from the client. A third type of client makes his/her own investment decisions and the Investment Manager simply executes the trades they request. When making trades for managed accounts or referral accounts, the Investment Manager must consider the client's current holdings (cash account and securities) as well as transaction in progress (authorized, but not yet executed and settled).

The firm has a Dealing Division that carries out all interactions with the market based on instructions received from the Investment Managers. They make bulk trades for the total shares authorized for the various clients.

When the trade is completed, funds are transferred from the client bank account and securities are transferred to the portfolio account.

System Objective:

To improve the services that the Investment Managers give.

Table 3. Investment Management Case Narrative (Carmichael, 1998)

The next component of the case record is an overview of the object model. See Figure 1 for Carmichael's overview of the class model which shows the following classes: *ClientGroup, Client, Opportunity, BankAccount, Holding, InitialHolding, Deal, BulkDeal,* and *Security*. More detailed documentation of the model would be included. For example, the *Client* package can be modeled

with three subclasses for *ManagedClient, ReferClient*, or *IndependentClient* or as a *General client* class with subclasses for *ManagedClient, ReferClient.* Alternative models should also be stored in the case record together with the author's opinion of the pros and cons of each.

BankAccount and *Holding* use Fowler's *account-entry* and *transaction* analysis patterns. Finally, the case will hold a design model (see Figure 2) that, in this case, is for a Java implementation. Other AP and DP are included in the detail design. The design model provides the final link from the business model to the implementation model and from the user to the programmer.

To summarize, a case record includes a narrative description, an overview of the class model, details of the class model, model alternatives and the justification for the selected alternative, and a design model. The narrative and overview of the class model are used to facilitate the communication between the user and the analyst during SRA. The other case components aid the analyst in developing the conceptual design and the programmers in implementing the design.

The next section illustrates how such a case might be used to support communication between the user and the analyst.

Even with a limited case description and a single sketchy case in our case database we can use CBR to support communication between the user and the analyst. Both the design problem and the investment manager cases would be indexed (at least minimally) as broker/agents. The user can understand the narrative and most likely the analysis class model (Figure 1), as well. By retrieving the narrative and analysis class overview from the Investment Management case, the analyst and user can begin a dialogue that will quickly lead to design details. For example, the following questions can be generated from the class overview:

- Is the broker going to do *BulkDeals* (i.e., act as an aggregator)?

- Is there an equivalent of *BankAccount*? (Will the broker bill the customer for the electricity used or only for the broker's fee?)
- How does the contract acquired by the customer differ from the investment manager's *Security*?
- Will customers have more than one contract (i.e., the equivalent of a *portfolio*)?
- What details about *Holdings* (contracts) does the system need to keep track of in order to help the brokers manage *Opportunities*?

Many of the questions could have been generated and answered during a traditional user interview. The difference is that with CBR the questions generated from the overview are linked to a conceptual design and to an analysis of the pros and cons of various design alternatives.

Other questions related to the detail of the class model would be generated as well, such as the following questions about the client package:

- Will there be three classes of customers (*Refer, Independent* and *Managed*)?
- If so, are there case features that would suggest a preference for either of the alternative models (one general class with two subclasses or three subclasses)?

The analysts are not only interested in the way business is conducted today, but also how the business might change in the future. If the energy broker does not have *Managed* accounts now, how likely is it that they will add them in the future? Is the likelihood sufficiently high to justify the additional cost of building the capability for *Managed* accounts into the system now?

As the questions are answered, the differences flow down through the system and change the final design model, which in turn changes the implementation. The recalled case suggests new ways of doing similar tasks, both at the strategic level and at the operations level. It suggests potential problems with alternative modeling approaches. It helps explain modeling choices.

To further illustrate the benefit of considering multiple past cases, a second case, the Freight Broker, is discussed. The narrative for this case is shown in Table 4.

Case description:

When a company wants to ship goods to their customers or to other plant locations, they contact freight carriers (trucking companies) to schedule the shipment. This is a labor-intensive task. Dispatchers may have to telephone several carriers before they can match their outgoing shipment with a truck that can make the delivery within the customer's schedule requirements.

Some Internet based freight broker exchanges focus on the "spot" market. Their systems function as an auction where a Shipper posts a shipment and Freight Carriers bid on it. The lowest cost Carrier who can meet the schedule constraints is awarded the shipment.

The spot market accounts for less than 20% of the total market. Most Shippers have a set of trusted Freight Carriers who have proven to be reliable. To schedule a shipment, their dispatchers begin by contacting these Freight Carriers first. They use the spot market only when none of their preferred carriers are available.

The system requirements are: a system that allows Shippers to post shipments on the Web, allows the Shipper to designate preferred Carriers, notifies Carriers when a Shipper has designated them as a preferred Carrier, allows the preferred Carriers to bid or decline the shipment or to make a counter offer (different time), allows the Shipper's dispatcher the opportunity to confirm or reject the offer or counter offer, rolls the shipment over to the next Carrier on the list of preferred Carriers if the first choice declines the shipment, and finally rolls the shipment over to the spot market if none of the preferred Carriers is able to make

the schedule or propose an acceptable alternative.
System Objective: To develop an online system that supports collaboration and communication between Shippersand Freight Carriers

Table 4 - Freight Broker System Narrative

The Freight Broker case raises a number of issues that were not considered in the Investment Manager case. First, the Investment Manager adds customer value by making recommendations to customers and by posting customer transactions on the stock exchange for the customer. The Freight Broker system is an exchange. It adds value by facilitating communication and matching shipments with carriers.

In some ways the Energy Broker system is like the Investment Management system—both make recommendations to customers. In other ways, the Energy Broker is more like the Freight Broker. How likely is it that the Energy Broker system will evolve into a web-based B2B exchange like the Freight Broker? This is an important question because it affects the way the current system should be designed.

There are other questions that the Freight Broker system raises:

- Does the Energy Broker need to have something similar to the *Preferred Carrier?*
- Will the Energy Broker act as an agent who is able to bind the customer to the contract or does the system require the customer to confirm and approve a contract?

The Freight Broker system was intended to save Shippers money by reducing the labor costs associated with scheduling shipments. The initial design did not accomplish that because

dispatchers were not eliminated. Their task changed from interacting with Carriers by telephone to re-entering shipment data from their company's production/order fulfillment system into the Freight Broker exchange. To address the problem, they developed custom interfaces for their large customers that allows them to dump shipment schedules directly into the exchange. This is an expensive solution because each customer has its own data format.

The Energy Brokers also have a problem with receiving system input in several different formats. Even though the Freight Brokers solution is inadequate, it is important to raise the issue and have the designers of the Energy Broker system consider how to address. In fact, additional indexing based on design problems can be added to the CBR system.

CONCLUSION AND SUMMARY

This paper discussed the usefulness of developing a CBR model to support user-analyst communication in the development of accounting based software. CBR has been used in several problem domains, including other engineering design tasks. Design patterns and analysis patterns are methods of case-based reasoning that are currently being used to support programmers, analyst, and designers. Developing a CBR system to support users during the requirements analysis phase seems like a logical extension. CBR contributes to the development process in two important ways. First, the indexing scheme is used to help the analyst generate questions about the system requirements. Second, the retrieved cases can be used to generate alternative designs and to weigh the pros and cons of various design choices. The examples in this paper illustrate the potential usefulness of such an approach.

Advantages of the case-based approach are:

- it will better support business process reengineering efforts

- it will make users more proactive in the development process
- it will encapsulate experience
- it will aid communication between user and designer
- it may improve system documentation

For CBR to be useful as a tool to aid analysts and users, cases like the Investment Management case presented by Carmichael (1998) must be compiled, indexed and used. Future research in this area should focus on identifying and indexing additional cases and exploring the development of computational tools to integrate CBR, design patterns, and analysis patterns.

DP and AP are represented graphically using UML or other documentation methods. Graphical depictions of the information in the case narratives should be developed and tested to determine whether the graphical or textual representation leads to better understanding by the users.

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HYPER MARKET INDUSTRY IN DUBAI – AN EVALUATION USING AHP TECHNIQUE

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Abstract

Among all retail formats hypermarket is growing very fast in UAE that is at the rate of 150 percent. The major players in this sector are Carrefour, Spinney's, United, Choithram and Lulu. The focus of the problem is selecting a best hypermarket among the existing operators of Dubai and for which we used seven major criteria for evaluating the hypermarkets such as product availability and variety, market coverage, channel density, customer density, nationality served, facilities and services and customer spending pattern. We used Analytic hierarchy process (AHP), developed by Thomas saaty (1980) to provide a simple but theoretically sound multiple criteria methodology for evaluating the alternatives.

Keywords

Hyper Market, Analytic hierarchy process, Multiple Criteria

Introduction about UAE Hyper Market Industry

The retail sector in the United Arab Emirates (U.A.E.) continues to grow and develop a process that began in earnest nearly 10 years ago. Annually, many new state of the art stores are added to the country's retail map, creating continuous competition among the major retailers. The new stores match Western retail establishments in size and variety. The estimated annual value of the U.A.E. retail market is $2.5 billion.

The estimated average annual growth in retail sales is 5-10 percent. First year retail establishments report higher growth rates than those claimed by established firms. Foods sold in retail outlets consist 75-80 percent of imported consumer-ready products, and 20-25 percent of locally processed foods.

The introduction of hypermarkets and superstores is re-shaping the retail sector. Hypermarkets openings increased 150 percent, reflecting the future market strength investors' hold for mega store operations. Superstore and supermarket openings grew only moderately, by 15 and 12.5 percent respectively. Convenient store openings are unknown, as no official data exists.

Retail development is concentrated in the three largest emirates of the UAE - Abu Dhabi, Dubai and Sharjah, home for nearly 75 percent of the population. Hypermarkets, superstores and supermarkets, despite their limited number, are estimated to account for nearly 50 percent of all retail sales. Smaller-sized groceries and convenience stores account for the other half.

Hypermarkets in UAE

Carrefour

The UAE's most dynamic, fast-moving and exciting hypermarket chain and it is a joint venture company by Majid al Futtaim. Carrefour France, this global expertise helps them to offer shoppers in the UAE the same quality, variety and value-for-money and stock over 100,000 items always. They are providing friendly staff, free parking, multiple checkouts to avoid waiting and of course some of the lowest prices, top names and best quality goods for the shoppers. Carrefour Working Hours is 9am to 12pm.

They have five main sections in their hypermarket such as Market, Consumer Goods, Light House Hold, Heavy House Hold and Textile. Carrefour hypermarket accepts the currencies such as UAE Dhs, US Dollars, Saudi Riyals, Kuwaiti Dinars, Omani Riyals, Qatari Riyals, Bahraini Dinars and Euros. In UAE they have stores in Abu Dhabi Airport Road, Abu Dhabi - Marina Mall, Ajman City Centre, Al Ain AL Jimi Centre, Dubai - Deira City Centre, Dubai - Al Shindagha, Dubai - Al Mamzar Century Mall, Dubai - Mall of the Emirates, Ras Al Khaimah Manar Mall and Sharjah City Centre.

Spinneys

Spinneys is considered as a company of great repute with a leading position in both retailing and wholesaling of consumer goods. Spinneys has been established for over 41 years and the brand has a well deserved reputation for quality and service. This Retail Chain in the Middle East was first started in 1924 in Alexandria by Arthur Rawdon. Spinneys Dubai have long been established as a premier retail outlet offering a wide product range, best quality, friendly service and convenient shopping. In April 1999, Ali Albwardy took 100% ownership of the Spinneys Dubai Group. The company operates ten retail outlets in Dubai and four in Sharjah. The largest is at the Mercato Centre with 40,000 sq ft.area.

LuLu Hypermarket

LuLu Hypermarket symbolizes quality retailing and has been an instant hit with the discerning customers in the UAE. With its pleasant and novel variation by integrating all the conceivable needs of the consumers under one roof, the Hypermarkets have extensively laid out counters, sprawling parking space, play area for children, food court, money exchange centers and bank counters besides a panoply of international and regional brands.

It caters to the divergent needs of the shoppers and transforms shopping into a pleasurable outdoor activity underlining once again the group's commitment to offer the customer only the best. Poised on the success of the pioneer Hypermarket at Al Qusais - Dubai, the chain is spreading its wings across the UAE, with Fujairah outlet in full swing, and extending to other countries beginning with Qatar and Kuwait.

United Hypermarket

United in the UAE, that continues to grow each year and attract broad-base support, particularly from U.A.E. nationals, Arab expatriates and other expatriates in the low-to-medium

income bracket. It is generally cater to local and Arab clientele and are known for competitive prices on but a limited range of products. In Dubai they have 8 branches in various areas like Satwa, Rashidiya, Hamriya, Awir, Tawar, Mankhool, Jumeirah and Ras al khore. But now they are planning for Ras Al Khore.

Choithram & Sons (TCS)

T. Choithram & Sons (TCS) it is an International hypermarket which has a sales value of 46 million US$ every year. Choithram has 27 branches in the gulf Region. It target mainly Indians and it is owned by Indian.

Literature Review

Óscar González-Benito (2002) examined the impact on demand of the competitive positioning strategies developed by the leading hypermarket chains in Spain. Specifically, the purpose is to carry out a geodemographic and socioeconomic characterization of the potential consumers of each chain. As retail attraction has traditionally been divided into three components, distance, mass and image, a gravitational model is proposed which distinguishes them and facilitates the evaluation of existing differences across any a priori segmentation base. The empirical test identifies significant geodemographic differences in the retail attraction of hypermarket chains. Chains seem to target the whole market by developing an image balanced against the advantages and disadvantages derived from the spatial coverage strategy. Social class is not as good an indicator of hypermarket choice as expected, although some interesting patterns have been detected.

Carlos Pestana Barros' and Carlos Alves (2003) estimates total productivity change and decomposes it into technically efficient change and technological change for a Portuguese retail store chain with data envelopment analysis. The benchmarking procedure implemented is an internal benchmarking, where the stores in the chain are

compared against each other. The aim of this procedure is to seek out those best practices that will lead to improved performance throughout the whole chain. In this study they rank the stores according to their total productivity change for the period 1999–2000, concluding that some stores experienced productivity growth while others experienced productivity decrease.

In 2005, Óscar González-Benito, Pablo A. Muñoz-Gallego and Praveen K. Kopalle aims to analyze the role of store format in retail competitive interactions, specifically, the relationship between growth, location strategy, and market response. To assess this relationship, they propose an extension of the classic models of spatial interaction, which incorporate the asymmetric competitive effects linked to the concept of store format. An empirical application allows confirming greater spatial rivalry within store formats (intra-format) than between stores formats (inter-format). This implies a certain hierarchical organization when consumers select a retail store, first choosing the type of store at which they will shop and later a particular store within this format.

Carlos Pestana Barros (2005) analysed the technical efficiency of a Portuguese hypermarket retail chain, in order to investigate the chain's performance. A stochastic Cobb-Douglas cost frontier model is used to generate retail chain efficiency scores. It is found that the chain's efficiency scores are high for some outlets and low for others. Therefore, the author proposes a modification of management procedures in order to enable efficiency to be increased, based on a governance-environment framework.

In 2006, Carlos Pestana Barros analysed a representative sample of hypermarkets and supermarkets working in the Portuguese market, using a benchmark procedure to compare companies that compete in the same market and thereby deriving managerial and policy implications. A two-stage procedure to benchmark the companies was adopted. In the first stage data envelopment analysis (DEA) is used and in the second stage a Tobit model is employed to estimate the efficient drivers.

Ricardo Sellers-Rubio and Francisco Mas-Ruiz (2007) compared different approaches to the evaluation of economic performance in retailing. For the first time in retailing, this essay simultaneously applies traditional productivity measures as well as parametric and non-parametric techniques to estimate efficiency, and compares the results obtained. The empirical application is carried out on a sample of 491 retailers operating in Spain in 2004. The results reveal important differences depending on the methodology employed. Overall, none of the methodologies can be said to be better than the rest.

In 2008 Justo de Jorge Moreno in his study aims to present an approach for analyzing hypermarkets efficiency data envelopment analysis (DEA) in Spanish retailing. In particular, the influence of the Retail Trade Act of 1996, by means of which the Spanish state transferred authority to concede licenses for opening commercial establishments to the regions, is to be studied. The findings suggest the existence of three different production frontiers in relation to the markets' regulation process where the hypermarkets operate; high, medium and low regulation. In the second place, the effect of the regulatory restrictions carried out by the autonomous communities is corrected in the second stage. This correction allows the hypermarkets operative in areas with low restrictions to be more efficient than those located in areas of greater regulation.

Research Methodology

This research is based on both primary and secondary data. Personal observation is conducted among the retail outlets to collect the details about the subjective factors selected for the study. The secondary data has been collected from the internet, brochures and hand bills of the retailers, government agencies and publications. The data is collected from 5 leading hypermarkets in Dubai. The analysis is done using Analytic hierarchy process (AHP) developed by Thomas saaty (1980) to evaluate the best retailer.

Analytic Hierarchy Process (AHP)

Analytic hierarchy process (AHP) was developed by Thomas saaty (1980) to provide a simple but theoretically sound multiple criteria methodology for evaluating alternatives. Applications can be found in such diverse fields as portfolio selection, transportation planning, manufacturing system design and in Artificial Intelligence, just to name a few.

The strength of the AHP lies in its ability to structure a complex, multi person, multiattribute problem hierarchically, and then to investigate each level of the hierarchy separately, combining the results as the analysis progresses. Pair wise comparisons of the factors (which depending on the context may be alternatives, attributes, or criteria) are undertaken using a scale indicating the strength with which one factor dominates another with respect to a higher level factor. This scaling process can then be translated into priority weights or scores for ranking the alternatives.

AHP start with the hierarchy of objectives. The top of the hierarchy focus on a problem statement. At the next level major considerations are defined in broad terms. This is usually followed by a listing of the criteria for each of the foregoing considerations. Depending on how much detail is called for in the model, each criterion may then be broken down into individual parameters whose values are either estimated or determined by measurement or experimentation. The bottom level of hierarchy contains the alternatives or scenarios underlying the problem.

We have done pairwise comparison of the alternative with respect to each criteria, similarly each criteria is also compared in the same manner. Here we have assigned codes such as C1 for Carrefour, C2 for Spinney’s, C3 for Choithram, C4 for United and C5 for LuLu hypermarket. Similarly we have assigned codes for the criterion such as MC for Market Coverage, PAV for

Product Availability and Variety, NA for Nationality Served, FS for Facilities and Services, CS for Spending Pattern, ChD for Channel Density and CuD for Customer Density

Market Coverage

Market covered such as more countries covered in GCC and emiratewise coverage is compared and pairwise comparison is made among the five retailers and preferences is allocated as below.

Table – 1 Market Coverage

	C1	C2	C3	C4	C5
C1	1.00	2.00	0.33	5.00	4.00
C2	0.50	1.00	0.25	4.00	3.00
C3	3.00	4.00	1.00	7.00	6.00
C4	0.20	0.25	0.14	1.00	0.50
C5	0.25	0.33	0.17	2.00	1.00

Product Availability and Variety

Product availability and variety of merchandise such as Vegetables and Fruits, FMCG and Provisions, Electronics, Dress materials and Fashion Accessories, Cosmetics, Perfumes, Furniture and Accessories, Bakeries, Magazine, Sports Items, Stationary Items, Cookware and Children wear are compared among the five alternatives as in the table below.

Table – 2 Product Availability and Variety

	C1	C2	C3	C4	C5
C1	1.00	6.00	9.00	5.00	1.00
C2	0.17	1.00	3.00	0.50	0.17
C3	0.11	0.33	1.00	0.33	0.11
C4	0.20	2.00	3.00	1.00	0.20
C5	1.00	6.00	9.00	5.00	1.00

Nationalities wise Classification of Consumers of Hypermarkets

The target market of the hypermarket is compared and pairwise comparison is done. More importance is given to those who cover majority of the nationality residing in Dubai. So for this purpose Nationalities like Local Arabs, Expat Arabs, Indians, Pakistanis, Other Asians, Europeans and Africans targeted by the retailers are assessed.

Table – 3 Nationality Served

	C1	C2	C3	C4	C5
C1	1.00	1.00	0.33	5.00	0.33
C2	1.00	1.00	0.33	5.00	0.33
C3	3.00	3.00	1.00	7.00	1.00
C4	0.20	0.20	0.14	1.00	0.14
C5	3.00	3.00	1.00	7.00	1.00

Facilities and Services in the Hypermarkets

Facilities and services provided by the hypermarkets such as Access to Transportation, Location, Fitting room, Toilets, Prayer Room, Waiting space, Elevators, Restaurant and Parking are compared to evaluate them.

Table – 4 Facilities and Services

	C1	C2	C3	C4	C5
C1	1.00	1.00	6.00	2.00	0.33
C2	1.00	1.00	6.00	2.00	0.33
C3	0.17	0.17	1.00	0.20	0.13
C4	0.50	0.50	5.00	1.00	0.25
C5	3.00	3.00	8.00	4.00	1.00

Spending Pattern of the Consumers

The average amount of purchase made by a consumer during peak hours in the peak days for different hypermarkets are observed. We made pairwise comparison as in the table below.

Table – 5 Spending Pattern

	C1	C2	C3	C4	C5
C1	1.00	5.00	5.00	3.00	0.33
C2	0.20	1.00	1.00	0.33	0.14
C3	0.20	1.00	1.00	0.33	0.14
C4	0.33	3.00	3.00	1.00	0.20
C5	3.00	7.00	7.00	5.00	1.00

Channel Density

More the counters, less is the waiting time for the customer and the customer satisfaction will be more at the same time. So we allocated the ratings based on the number of counters in the hypermarkets.

Table – 6 Channel Density

	C1	C2	C3	C4	C5
C1	1.00	7.00	7.00	3.00	0.33
C2	0.14	1.00	1.00	0.20	0.11
C3	0.14	1.00	1.00	0.20	0.11
C4	0.33	5.00	5.00	1.00	0.20
C5	3.00	9.00	9.00	5.00	1.00

Customer Density

The number of consumer purchases and leaves the counter during peak hours in the peak days is assessed and rated as below.

Table – 7 Customer Density					
	C1	**C2**	**C3**	**C4**	**C5**
C1	1.00	1.00	3.00	0.50	0.20
C2	1.00	1.00	3.00	0.50	0.20
C3	0.33	0.33	1.00	0.33	0.14
C4	2.00	2.00	3.00	1.00	0.25
C5	5.00	5.00	7.00	4.00	1.00

Conclusion

We used three level hierarchy developed for evaluating five different hypermarkets in the hypermarket Industry of Dubai (UAE). The focus of the problem is selecting a best hypermarket among the existing operators of Dubai and the seven major criteria such as product availability and variety, market coverage, nationality served, facilities and services provided, customer spending pattern, channel density, customer density are determined for the above evaluation.

Table 8 Local and Global Priorities for evaluating five different competitors in the hypermarket Industry of Dubai

	Local Priorities							
Alternative	**NC** 0.09	**PAV** 0.32	**NA** 0.17	**PS** 0.04	**CS** 0.17	**ChD** 0.04	**CuD** 0.17	**Global Priorities**
C1	0.23575	0.39775	0.13461	0.19224	0.25785	0.26700	0.11355	**0.2521**
C2	0.15290	0.07063	0.13461	0.19224	0.05257	0.03825	0.11355	0.0968
C3	0.49657	0.03500	0.34687	0.03596	0.05257	0.03825	0.05125	0.0911
C4	0.04578	0.09888	0.03703	0.11773	0.12222	0.13714	0.18108	0.1044
C5	0.06901	0.39775	0.34687	0.46184	0.51480	0.51936	0.54057	**0.4137**

So based on our evaluation LuLu (C5) is a best hypermarket operating in Dubai and the next best hypermarket is the Carrefour (C1). In this global competitive scenario, as a part of managerial implication, retailers can make use of this model for evaluating various retail mix and also for scrutinizing competitor's performance.

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CELEBRITY EFFECT ON BRAND POSITIONING: A STUDY WITH REFERENCE TO FEMALE PERSONAL CARE PRODUCTS

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Abstract

India is a developing country that is flooded with different brands. With too many products flooding the market, companies find it difficult to differentiate their products based on their inherent product features. In fact, advertising is an effective marketing tool available to marketers to create and promote awareness for their products. To make the advertisement more attractive and avoid the media clutter, companies use celebrities to endorse their products. The demand for instant recall, brand awareness, and emotional bonding with customers has made celebrity endorsements the latest trend. Celebrities add new dimensions to a brand. As a result of the increase in celebrity advertisements in various media, India has become a celebrity-obsessed society.

The majority of celebrity endorsement research has focused on the effectiveness and selection of celebrity endorsers. This research paper studied the effect of celebrity endorsements on the brand positioning of select female personal care products through television advertisements. The Indian scenario was suitable to study the effect of celebrity endorsements on brands and the ultimate decision of consumers to buy particular brands.

Keywords

Celebrity Effect, Brand Positioning, Personal Care Products and Celebrity Endorsement

Introduction

Brand positioning is a major decision in marketing that seeks to build an image of a product in consumer's mind. It is a function of the brand's promise and comparison with other choices with regard to quality, innovation, perceived leadership, value, prestige, trust, safety, reliability, performance, convenience, concern for customers, social responsibility, technological superiority and so on. Kotler (2002) aptly defined "positioning as the act of designing the company's offering and image to occupy a meaningful and distinct position in the mind of the target customers" (p.308).

Product positioning denotes the specific product category or product class in which the given product is competing, and brand positioning denotes the positioning of the brand compared to competing brands in the chosen product category (Ramaswamy & Namakumari, 2002).

Ries and Trout (1997) suggested that, to succeed in the competitive market, the first step is to position the brand in the target consumers' mind in such a way, that in their perception of the brand, it is distinctive and offers more customer value than its competitors do.

Celebrity endorsement is an easy way to connect with consumers. Celebrities enjoy public recognition and they can use this recognition on behalf of a product by appearing in an advertisement for the product (McCracken, 1989). Strong celebrities can help the consumers to connect with the brand and lead them to retail outlets to purchase the brand. Celebrities can reduce the time for consumer to move from awareness to action.

Study Objective

The purpose of this study was to investigate the brand positioning strategies of select personal care brands and to know the role of celebrities in positioning the brands in the minds of the respective target audience. For the purposes of this study, the two female personal care products that were advertised the most frequently on television during the first half of 2007 were selected: Lux soap and Pantene Pro -V shampoo.

Table 1 identifies the celebrities, the products that they endorsed, the companies that manufacture the products, and the agencies that advertise the products.

Table 1

Personal Care Brands Endorsed on TV by Celebrities: January 2007 - June 2007

Brand	Celebrity	Company	Advertising Agency
Lux soap	Priyanka Chopra, Shreya	Hindustan Unilever	James Walter Thompson
Pantene Pro V shampoo	Sushmita Sen	Proctor & Gamble (P&G)	Gray Worldwide India

Source: Primary data

Lux is one of the most trusted brands in India. Indian celebrities Leela Chitnis, Aishwarya Rai, and Priyanka Chopra have endorsed Lux soap. It is probably the only brand that has had an endorsement from nearly 50 Indian film stars. The brand promise has evolved from "the beauty bar of film stars" to "brings out the star in you"(see Table 2). During the study period, Priyanka Chopra and Shreya endorsed Lux soap in two TV advertisements. Priyanka Chopra is an Indian film actor who was former Miss World in 2000. She now works in Bollywood films. Shreya is a South Indian film actor. Television commercial highlighted the freshness and beauty of Lux soap to the target audience.

Table 2

Brand Positioning of Select Personal Care Brands

Brand	Positioning meaning	Target audience (age range)
Lux soap	Bring out the star in you	Young generation females (18-35)
Pantene Pro V shampoo	For shining strong healthy hair	Multitasking women (18-30)

Source: Primary data

P&G has re-launched its Pantene Pro V shampoo with Sushmita Sen as the new brand ambassador. Pantene with Pro V shampoo provides radiance and shine, as well as strength and conditioning benefits. Sushmita Sen is a well-known Bollywood actor and former Miss India. Television commercials for Pantene Pro V shampoo appeared in general entertainment channels and youth and News channels, highlighting the positioning meaning of shiny, strong, and healthy hair.

Literature Review

Review of Brand Positioning

Sengupta (1998) pointed out that positioning strategies require that the brand answer the following questions convincingly:

1. Who am I? (the brand's identity, lineage, or family).
2. What am I? (the functional capabilities of the brand).
3. For whom am I? (the consumer segment that the brand serves best).
4. Why me ? (powerful reasons to choose this brand rather than an alternative brand).

Sridhar (2006) indicated that a strong brand position means that the brand has a unique, credible, sustainable, and valued place with the customers. Brand has the capacity to capture the imagination. The brand name is what most people remember and recall. Sharply positioned brands stand out from the competition.

Clow and Baack (2007) stated that the quality of a product, prices charged, methods of distribution, image, communication tactics, and other factors create positioning and are, in turn, affected by the brand's position. Lebu (2006) commented that a brand's positioning constitutes not only a powerful factor contributing to its identification but also an equally powerful instrument of differentiation.

Shimp (2003) pointed out that a good positioning statement should satisfy two requirements: (a) It should reflect the brand's competitive advantage, and (b) it should motivate customers to action. The positioning statement for a brand represents how the company wants customers to think and feel about the brand. Trout (2005) suggested that branding is about the process of building a brand. Branding and positioning are like two sides of the same coin in that one without the other does not have the same effect. Advertising is one of the most frequently used and powerful communication strategies to build a brand. The central task of advertising is to place the brand in the desired position in the consumers' mind.

Review of Celebrity Endorsement

Joseph (1982) stated that physically attractive celebrities have a positive effect on the consumers' evaluations and opinions of a product. An attractive celebrity is likely to be an especially potent source of brand image because of the dual impact of their celebrity status and attractiveness. Physically attractive celebrities have a positive effect on the products and brands with which they are associated. Hsu and McDonald (2002) suggested that multi-celebrity endorsement advertising might appeal to multiple audiences. Given that advertisers can afford to employ a number of celebrities, multi-celebrity endorsement advertising may help the advertisers to build a sense of consensus, avoid audience boredom and appeal to multiple audiences.

Friedman and Friedman (1979) hypothesized and later concluded that the use of celebrity rather than noncelebrity endorsers in advertisements leads to higher believability, a more favorable evaluation by consumers of the product and advertisements, and a significantly higher intention among consumers to purchase the product. Pringles (2004) stated that celebrity endorsements act as signposts to quality and can significantly enhance brand reputations. Consumers who use products that are associated with celebrities get a little bit extra in terms of imagery, aspiration, and entertainment, factors that often just may be enough to tip the balance in favour of one brand over its competitors on the supermarket shelf or in an Internet search engine return.

Gupta (2003) pointed out that celebrities may be successful in drawing the consumers' attention piquing their interest or desire, and penetrating the target customers' perceptual mapping. Fam and Walter (2008) investigated what contributes to advertising likeability and advertising dislike ability in India by surveying individuals in Mumbai. They found that the Indian respondents had a positive attitude towards advertising in general. The study identified seven likeable attributes: 'entertaining,' 'warmth', 'strong/distinctive/sexy', 'soft sell', 'relevant to me', 'trendy/modernity/stylish', and 'status appeal'. The attitude toward the television commercials was attributed to general Indian values, family values and adherence to religious principles/tenets/beliefs.

Till and Busler (1998) reported that the majority of research on celebrity endorsers, although concerned with the effectiveness of celebrity endorsers, has provided little direction regarding the management of associations that which celebrities can bring to the endorsed brands. Many studies on celebrity endorser have considered the impact of celebrities on consumers' attitudes toward brands and/or the advertisements. Based on the research gap, this paper attempted to study the effect of celebrity endorsement on brand positioning of two female personal care brands.

Research Method

This study employed a descriptive research design. It described data and characteristics about the population or phenomenon being studied. The fundamental reason for descriptive research is to identify the cause of something.

Sample Size

This study was conducted in Chennai City. The researcher conducted a pilot study to determine the sample size. Based on the pilot study of 40 female respondents, the actual sample size of 288 female was determined with the help of a sampling formula. Purposive sampling was used to select the sample from the target population of females ages 18 to 35.

The following question was asked to determine the sample size:- Whenever there is an advertisement on TV, how frequently do you change the channel?

Very Often (4) Often (6) Occasionally (6) Rarely (16) Never (8)

The respondent's answers to *occasionally*, *rarely*, and *never* were treated as a positive outcome: their answers to *very often* and *often* were treated as a negative outcome.

The following formula used for sample size calculation (Kothari, 2003):

$$N = \frac{z^2 p q}{e^2} \quad \text{..... (1)}$$

N= Size of the sample

z = normal distribution value at 95 % confidence interval = 1.96
p = Sample proportion (positive outcome), - *p* = 30/40 = 0.75
q = negative outcome, q = 1-p
q = 1-.0.75=.025
$N = (1.96)^2 \times 0.75 \times 0.25 / (0.05)^2 = 288.12$

The data were collected from the responses to the open-ended and close-ended questions on the questionnaire.

Data Analysis

Table 3 shows the demographic profiles of the respondents in terms of their age, marital status and educational qualifications. Of the 288 respondents, the majority were in the age group of 22 to 25.

Table 3

Demographic Profile of Respondents

Age Group	Frequency	Percent
Up to 21	87	30.2
22 to 25	113	39.2
26 to 29	59	20.5
30 to 33	20	6.9
34 and above	9	3.1
Total	288	100.0

Marital status	Frequency	Percent
Married	109	37.8
Unmarried	179	62.2
Total	288	100.0

Educational qualifications	Frequency	Percent
Graduate	139	48.3
Post graduate	108	37.5
Professional	36	12.5
Others	5	1.7
Total	288	100.0

Source: Primary data

Priyanka Chopra and Shreya endorsed Lux Soap in two different advertisements.

Out of 288 female respondents, 18.1 percent recalled both the celebrities correctly.

Priyanka Chopra is the most recalled celebrity by the respondents (see Table 4)

Table 4

Recall of Celebrities in Lux Soap TV Advertisement

Not able to recall both celebrities	Rightly recalled both celebrities	Rightly recalled Priyanka Chopra	Rightly recalled Shreya	Wrongly recalled both celebrities	Total
28 (9.7)*	52 (18.1)	154 (53.5)	30 (10.4)	24 (8.3)	288 (100)

Source: Primary Data
* Numbers in parentheses indicates percentages

Table 5 shows the level of satisfaction for Lux soap TV advertisements that use celebrities like Priyanka Chopra and Shreya. Of the 288 respondents, 51 % were satisfied with the attractiveness of the celebrities, but only 12.5 % were highly satisfied with the product message in the advertisement.

Table 5

Level of Satisfaction for Lux Soap TV Advertisement

Elements	Highly satisfied	Satisfied	Neutral	Dissatisfied	Highly dissatisfied
Celebrity attractiveness	72 (25)*	147 (51)	61 (21.2)	5 (1.7)	3 (1)
Product message	36 (12.5)	115 (39.9)	120 (41.7)	12 (4.2)	5 (1.7)
Colourfulness of the advertisement	73 (25.3)	148 (51.4)	60 (20.8)	6 (2.1)	1 (0.3)
Celebrity brand fit	52 (18.1)	107 (37.2)	111 (38.5)	14 (4.9)	4 (1.4)

Source: Primary Data
* Numbers in parentheses indicates percentages

The table 6 shows that 25 % of the respondents strongly agreed that Lux is a beauty soap; however, 26.4 % strongly disagreed with the positioning meaning, which stated, “If I was using Lux soap, I feel and think it brings out the star in me.”

Table 6

Respondents' Opinion About the Positioning Meaning of LUX Soap

Elements	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
I associate Lux with a beauty soap	72 (25)*	117 (40.6)	64 (22.2)	31 (10.8)	4 (1.4)
Lux soap is for young generation females	43 (14.9)	93 (32.3)	73 (25.3)	68 (23.6)	11 (3.8)
If I was using Lux soap, I feel and think it brings out the star in me	17 (5.9)	42 (14.6)	57 (19.8)	96 (33.3)	76 (26.4)

Source: Primary Data

* Numbers in parentheses indicates percentages

The table 7 reveals that nearly 60 % of the female respondents correctly recalled Sushmita Sen as the celebrity in the Pantene Pro V TV advertisement.

Table 7

Recall of Celebrity in Pantene Pro V TV Advertisement

Not able to recall the celebrity	Rightly recalled Sushmita Sen	Wrongly recalled the celebrity	Total
31 (10.8)*	172 (59.7)	85 (29.5)	288 (100)

Source: Primary Data

* Numbers in parentheses indicates percentages

Table 8 indicates the level of satisfaction for Pantene Pro V shampoo TV advertisement. About 40 % of the respondents were satisfied with the elements of celebrity attractiveness, product message, colourfulness of the advertisement, and celebrity brand fit. Their satisfaction level was higher for celebrity attractiveness. The results showed that Sushmita Sen was the right choice as the celebrity in the Pantene Pro V advertisement.

Table 8

Level of Satisfaction for Pantene Pro V Shampoo TV Advertisement

Elements	Highly satisfied	Satisfied	Neutral	Dissatisfied	Highly dissatisfied
Celebrity attractiveness	58 (20.1)*	128 (44.4)	81 (28.1)	15 (5.2)	6 (2.1)
Product message	21 (7.3)	132 (45.8)	120 (41.7)	9 (3.1)	6 (2.1)
Colourfulness of the advertisement	50 (17.4)	122 (42.4)	97 (33.7)	18 (6.3)	1 (0.3)
Celebrity brand fit	39 (13.5)	116 (40.3)	107 (37.2)	16 (15.6)	10 (3.5)

Source: Primary Data

* Numbers in parentheses indicates percentages

Table 9 shows the reach of the positioning meaning of Pantene Pro V shampoo through a celebrity endorsement. Only 16 % of the respondents strongly agreed that Pantene Pro V shampoo can be associated with shiny, strong, and healthy hair. The majority (33.3 %) neither agreed nor disagreed with the positioning meaning of Pantene Pro V shampoo.

Table 9

Respondents Opinion About the Positioning Meaning of Pantene Pro V Shampoo

Elements	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
I associate Pantene Pro V shampoo with shiny, strong, and healthy hair	46 (16)*	89 (30.9)	96 (33.3)	38 (13.2)	19 (6.6)

Source: Primary Data

* Numbers in parentheses indicates percentages

Table 10 shows that of the 288 respondents, 17.4 % were using Lux soap and 26.7 % were using Pantene pro V shampoo.

Table 10

Distribution of Study Brand Users and Nonusers

Brand	No of respondents	Users	Nonusers	Percent of users
Lux soap	288	50	238	17.4
Pantene Pro V shampoo	288	77	211	26.7

Source: Primary data

Null Hypothesis

There is no significant difference in the users' and the nonusers' perceptions of Pantene Pro V shampoo.

The analysis in Table 11 clearly indicates that the *p* value was less than .05, so the null hypothesis is rejected at a 5 % level of significance. There was a significant difference in the perceptions of Pantene Pro V shampoo between the users and the nonusers in terms of "I associate Pantene Pro V shampoo with shiny, strong, and healthy hair."

Table 11

One-way ANOVA for the Perception of Pantene Pro V between Users and Nonusers

I associate Pantene Pro V shampoo with shiny, strong, and healthy hair	*SS*	*df*	*MS*	*F*	Sig
Between groups	27.520	1	27.520	24.504	.000
Within groups	321.199	286	1.123		
Total	348.719	287			

Source: Primary data

Research Findings

The findings indicated that product quality, brand name, and influence of friends and family members were identified by the female respondents as the top three factors influencing their purchase of personal care products. Out of 288 respondents, nearly 20 % revealed that they use Hamam soap; followed by 17.4 % who use the study brand, Lux' and 12.5 %, who use Dove. It was surprising that nearly 7 % of the respondents use famous brands of baby soap, including Johnson & Johnson's baby soap, Wipro's baby soap and Kids Soft for Bathing.

Majority (80.6 %) female respondents use their choice of bath soap because of its quality. Nearly 7 % identified using their brand of soap based on TV advertisements. Other notable reasons given by the respondents, fragrance, reasonable price, family soap, attractive packaging, and doctor's advice.

The findings indicated that although 25 % of the respondents strongly agreed that Lux is beauty soap, 26.4 % strongly disagreed with the positioning meaning, "If I was using Lux soap, I feel and think it brings out the star in me." The reach of positioning meaning and product message clearly was low in the Lux soap advertisements.

The majority (92.4 %) of the respondents indicated that they are regular users of shampoo. Of the 266 shampoo users, 28.9 % use Pantene Pro V shampoo. It was the most used shampoo, followed by Clinic Plus and Sunsilk. The quality of the shampoo, the desire for shiny hair, and the influence of TV advertisements were the major reasons given by the respondents for using a particular brand of shampoo. The satisfaction level of celebrity attractiveness and the recall of Sushmita Sen in the Pantene Pro V advertisements were comparatively higher than the Lux soap TV commercial.

This shows celebrity Sushmita is the right choice for Pantene Pro V advertisement. It is evident clear that only 16 percent of the female respondents strongly agree that Pantene Pro V shampoo can be associated with shining strong healthy hair.

Recommendations

It is clear that respondents liked to watch the celebrities in the advertisement. They expected that celebrities would be honest and would provide the correct information about the brand. There was a strong belief among the respondents that the celebrities did not use the endorsed products themselves. To avoid this perception, the product companies may wish to select celebrities who are using their products; otherwise, advertising and media strategies should be developed to ensure that the celebrities are using the same brands that they are endorsing.

For personal care product endorsements, companies can choose homely, pleasant newsreaders, serial actors, famous doctors, and film celebrities to endorse their brands. To increase the image of brands among the target audience, two or more celebrities might be used to endorse the same brands in the same or different TV advertisements. Consumers are very interested in watching multiple celebrities in a single advertisement. This strategy will help to ease audience boredom and increase the brands' appeal to multiple audiences.

It is suggested that the product message, product benefits, positioning meaning, and frequency of Lux soap TV advertisements should be increased to convert non-users to users. It is recommended that the Pantene Pro V TV advertisements should highlight that celebrity Sushmita Sen is a regular user of Pantene Pro V shampoo. This will give users and future buyers confidence about using Pantene Pro V shampoo.

Direction for Future Research

This study has focused on the influence among consumers of celebrity endorsements in TV advertisements for a 6 - month period. Though the research was limited to two personal care products, the recommendations are applicable to similar product categories. This study offers an extended scope for further research into other media with relevance to other product categories and the perceptual mapping of similar brands.

Conclusion

This research provided insights into the celebrity effect on the brand positioning of Lux soap and Pantene Pro V shampoo among consumers. The findings and recommendations may be useful for the brand managers and the advertising agencies associated with the respective companies to modify their advertisements and the use of celebrity endorsers. The role of advertising is to communicate a brand's position effectively. If properly used, celebrity endorsements are an effective tool to position the brand among the consumers. Successful positioning depends on communicating the brand's differential advantage effectively, so all of the advertising efforts and other forms of promotions should attempt to communicate the brand's position to consumers. The result of positioning is the successful creation of a customer-based value proposition**.** Powerful positioning leads to a powerful brand.

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MODIFIED PIPELINING HYBRITIZATION OF JOB SHOP SCHEDULING

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Abstract

Hybridization involves generally genetic algorithm in a stage .Here instead of genetic algorithm, metaheuristics method Local search method, is applied as primary search routine, for tackling combinatorial search and optimization problems.The dispatching rule LPT is applied first, serving as a preprocessor. The local search methods are works on the iterative exploration of a solution space: at each iteration a local search algorithm start search from one solution to one of its neighbor. The method is analysis the job shop bench mark problems. The comparison of the performance measure is evaluated.

Keywords

Dispatching rule,LPT,local search, makespan, jobshop

Introduction

Scheduling problem can be defined as the task of associating one or several resources to activities over a certain time period. These problems are of particular interest both in the research community and in the industrial environment. They commonly arise in business operations, especiously in the areas of supply chain management, air flight crew scheduling and scheduling for manufacturing and assembling.

More over scheduling problems arise also in other organization such as schools (as to home as Calvin suggested) universities and hospitals.Generlly speaking, scheduling problems belong to the class of combinatorial optimization problems.

Makespan: The makespan, defined as max ($C1……C_n$), is equivalent to the completion time of the last job to leave the system. A minimum makespan usually implies a high utilization of the machines. It is denoted by $C_{max.}$

Dispatching rules

The Longest processing time first (LPT) rule assign longest processing jobs to machines and the shortest job is the last job to start its processing and also the last job to finish its processing. This rule used to place the shorter jobs toward the end of the schedule, where they can be used for balancing the loads. LPT rule is used for job shop problem and output machine sequence is used as population of local search.

Local search

Optimization techniques can be classified into two categories (1) local search (2) global search methods. A local method uses local information about the current set of data (state) to determine a promising direction for moving some of the dataset, which is used to form the next set of data.[1].The advantages of local search techniques is that they are simple and computationally efficient. The Local Search (by Stephan Kreipl) works only for Ordinary environment. It has a feature of stopping on demand. In other words, the user can choose the time period the algorithm is allowed to run, or even stop the algorithm at any moment and load the best schedule found so far.

Simulated annealing:

The one of local search method is simulated annealing .This neighborhood search method produced good results for combinatorial optimization problems. After introduced this method by Kirkpatrick et.al (1983) and by Cerny (1985), is being used to optimize traveling salesman problem, complex scheduling problem etc.Simulated annealing initially produce a solution randomly. Every stage current solution is chosen by comparing the neighborhood solution, if it is equal or less.cost.A new solution with a higher cost is accepted with a probability that decreases as the difference in the costs increases and as the temperature of the method decreases. Temperature is reduced periodically by a scheme; so that it reduced to zero as the problem continuses.As the temperature reaching zero the method gets a local optimum. This is because simulated annealing has performed many perturbations at higher temperatures which have pushed the search path into new areas, and so a

better local optimum solution will be reached. Several authors Matsuo et al [21], van laarhoven et al, [27] DellAmico and Trubian [8] and Nowicki and Smutnicki [23] observed that the choice of a good initial solution is an important aspect of algorithms performance in terms of solution quality and computational time.

The design of neighborhood is a very important aspect of a local search procedure. For a single machine, a neighborhood of a particular schedule may be simply defined as all schedules that can be obtained by doing a single adjacent pair wise interchange. This implies that there are n-1 schedules in the neighborhood of the original schedule. A larger neighborhood for a single machine schedule may be defined by taking an arbitrary job in the schedule and inserting it in another position in the schedule , each job can be inserted in n-1 other positions. The entire neighborhood of a schedule in a more complicated machine environment is usually more complex.

An interesting example is a neighborhood designed for the job shop problem with the makespan as objective. A critical path in a job shop schedule is used to describe the neighborhood. At t=0 the process starts and finishes at $t=C_{max.}$ The completion time of each operation on a critical path is equal to the starting time of the next operation on that path. optimize the makes pan, sequences of the operations must be changed on the critical path. A simple neighborhood is as follows: The set of schedules whose corresponding sequences of operations on the machines can be obtained interchanging a pair of adjacent operations on the critical path of the current schedule .Note that, to interchange a pair of operations on the critical path, the operations must be on the same machine and belong to different jobs. If there is a critical path, then the number of neighbors within the neighborhood is at most the number of operations on the critical path, then the number of neighbors is the number of iterations on the critical path - 1.

Dorndorf and Pesch (1995) method that a framework should be constructed which navigates these local decisions through the search domain in order to determine a high quality global solution in a reasonable amount of time. The meta-heuristics or iterated local search algorithms having the

framework local decisions made by myopic problem specific heuristics are guided beyond local optimality by an underlying metastrategy.

There are number of ways the neighborhood search can be done. To select schedules in the neighborhood at random is a simple method; the schedules are evaluated and decide which one to accept. The acceptance _rejection criterion is usually the design aspect that distinguishes a local search procedure the most. In simulated annealing, the acceptance –rejection criterion is based on the probalistic process, where as in tabu search it is based on a deterministic process.

Simulated annealing is a search process that has its origin in the fields of material science and physics. It was first developed as a simulation model for describing the annealing process of condensed matter. The simulated annealing procedure goes through a number of iterations. At iterations k of the procedure, there is a current schedule S_k as well as a best schedule found so far, S_o .For a single machine problem, these schedules are sequences of the jobs. Let D (S_k) and D (So) denote the corresponding values of the objective function. Note that D (S_k) ≥ D (So). D (So) is called aspiration ratio because the value is best schedule so far. .The algorithm, in its research for an optimal schedule, moves from one schedule to another. At iteration k, a search for a new schedule is conducted within the neighborhood of S_k.Candidate schedule, S_d is selected from the neighborhood, initially. This done by in an organized possible sequential or random way. If $D(S_k) < D(So)$,a move is done, let $S_{k+1}= S_k$.If $D(S_d) < D(So)$,then $S_o= S_k$.However, if that $D(S_d) \geq D(So)$,a move is made to S_d with probability

$$P (S_k, S_d) =\exp ((D (S_k) - D (S_d))/\beta_k$$

With probably 1-$P(S_k,S_d)$ schedule S_d is rejected in favor of the current schedule, setting $S_{k+1}= S_k$.Schedule So does not change when it is better than schedule S_d.The controlling parameters are to be $\beta_1 \geq \beta_2 \geq \beta_3 \geq \ldots > 0$ referred to as cooling parameters. The parameter β_k is set to be c^k for some c between 0 and 1.The move to worse solution is possible in above description. The reason for allowing these moves is to give the procedure the opportunity to move away from a local minimum and after find a better solution. Because

β_k reduces with k, , in later iterations the acceptance probably for a non improving move is lower in search process.

Simulated Annealing Algorithm:

Step 1. Set k=1 and select β_1.

Select an initial sequence S_1 using some heuristic.

Set $S_o = S_1$

Step 2. Select a candidate schedule S_d from the neighborhood of S_k.

If $D(So) < D(S_d) < D(S_k)$, then $S_{k+1} = S_k$ and go step 3.

If $D(S_d) < D(S_o)$,set $S_o = S_{k+1} = S_d$ and go to step 3.

If $D(S_d) < D(S_k)$,generate a random number U_k from a uniform distribution (0.1).

If $U_k \leq P(S_k,S_c)$, set $S_{k+1} = Sc$; otherwise set $S_{k+1} = S_k$ and goto step3.

Step 3. Select $\beta_{k+1} \leq \beta_k$.

Increment k by 1.

If k =N then stop, otherwise go to step 2.

Modified Pipelining hybrids

Pipeline hybrids are the most commonly used and simplest method, in which the genetic algorithm and some other optimization techniques are applied sequentially- one, generates data used by the other. Modified pipeline hybrids use local search method instead of genetic algorithm and LPT dispatching rule. Here local search is applied last like the second type of pipeline hybridization (primary search routine).

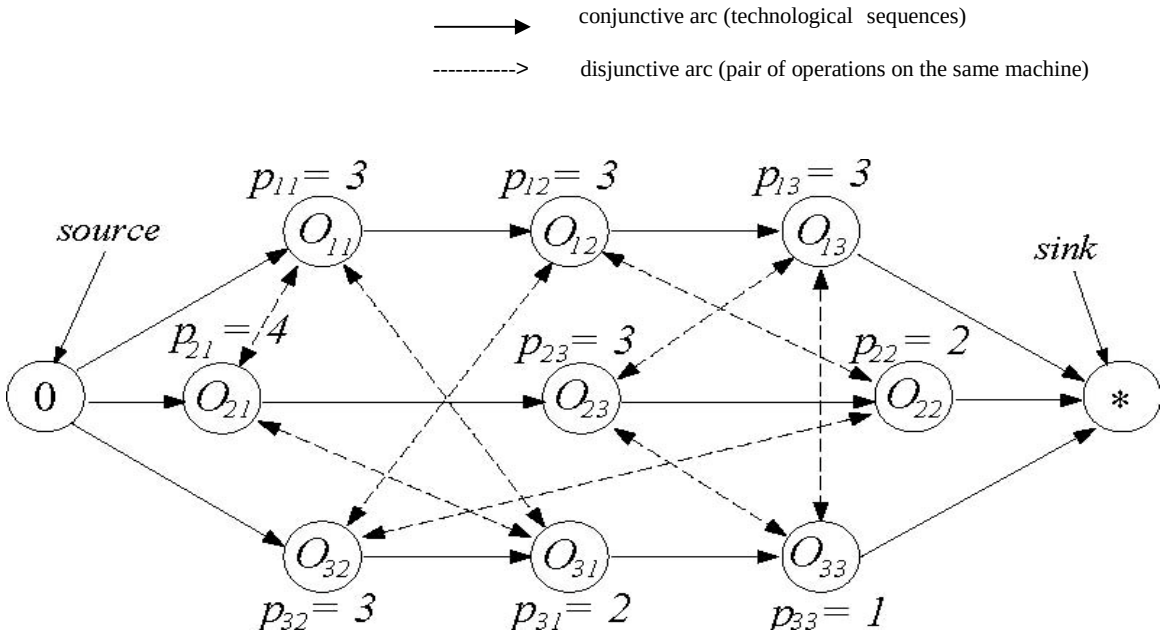
Problem Description

The *n*×*m minimum-makespan* general job-shop scheduling problem, known as the JSSP, can be described by a set of *n* jobs $\{J_j\}_{1 \leq j \leq n}$ which is to be processed on a set of *m* machines $\{M_r\}_{1 \leq r \leq m}$. Each job has a technological sequence of machines to be processed. The processing of job J_j on

machine M_r is called the *operation* O_{jr}. Operation O_{jr} requires the exclusive use of M_r for an uninterrupted duration p_{jr}, its processing time. A *schedule* is a set of completion times for each operation $\{c_{jr}\}_{1\le j\le n, 1\le r\le m}$ that satisfies those constraints. The time required to complete all the jobs is called the *makespan Cmax*. The objective when solving or optimizing this general problem is to determine the schedule which minimizes *Cmax.* The JSSP is not only *NP*-hard, but it is one of the worst members in the class. An indication of this is given by the fact that one 10 × 10 problem formulated by the researchers Muth and Thompson remained unsolved for over 20 years. The JSSP can be formally described by a disjunctive graph $G = (V, CUD)$,where

- V is a set of nodes representing operations of the jobs together with two special nodes, a *source* (0) and a *sink* *, representing the beginning and end of the schedule, respectively.
- C is a set of conjunctive arcs representing technological sequences of the operations.
- D is a set of disjunctive arcs representing pairs of operations that must be performed on the same machines.

The processing time for each operation is the weighted value attached to the corresponding nodes. The following figure shows this in a graph representation for a typical 3x3 problem,



O_{ij} : an operation of job *i* on machine *j pij* : processing time of *Oij*

Figure :1 A disjunctive graph of a 3 × 3 problem

Job-shop scheduling can also be viewed as defining the ordering between all operations that must be processed on the same machine, i.e. to fix precedence between these operations. In the disjunctive graph model, this is done by turning all undirected (disjunctive) arcs into directed ones. A *selection* is a set of directed arcs selected from disjunctive arcs. By definition, a selection is *complete* if all the disjunctions are selected. It is *consistent* if the resulting directed graph is acyclic.

A schedule uniquely obtained from a consistent complete selection by sequencing operations as early as possible is called a *semi-active* schedule. In a semi-active schedule, no operation can be started earlier without altering the machining sequences. A consistent complete selection and the corresponding semi-active schedule can be represented by the same symbol *S* without confusion. The makespan *L* is given by the length of the longest weighted path from source to sink in this graph. This path *P* is called a *critical path* and is composed of a sequence of *critical operations*. A sequence of consecutive critical operations on the same machine is called a *critical block*.

The problem is to find the schedule that minimize the makespan the following constraints are subjected(a) the precedence of operations given by each job are to be respected, (b) each machine can perform at most one operation at a time and(c) the operations cannot be interrupted,(d) the operations cannot be repeated in the same machine(preemptive).

Let:

J= {1… n} mention the set of jobs;

M= {1… m} mention the set of machines;

V = {0, 1 …n+1} mention the set of operations, where 0, n=1 denote the start and end dummy operations, respectively.

A be the set of pair of operations constrained by the precedence relations as in (a);

V_k be the set of operations performed by the machine k;

P_v and t_v denote the processing time and (variable) start time of the operation v, respectively. The processing time of the 0 and n+1 operations is equal to zero, i.e $p_o=p_{n+1}=0$.

The problem can be stated as

Minimize t_{n+1}

Subject to

$t_j-t_i \geq p_i$ (i,j)€A,

$t_j-t_i \geq p_i$ V $t_i- t_j \geq p_j$, (i,j) € E_kk, € M,

$t_i \geq 0$, i €V

The first set of constraints represents the precedence relations among the operations of the same job , whereas the second set of constraints describes the sequencing of the operations on the same machine. These constraints impose that either $t_j-t_i \geq p_i$ or $t_i- t_j \geq p_j$

Any feasible solution of the problem (a) is called schedule.

Computational results

The bench mark problems are downloaded from the website of Prof Eric Taillard and OR Library.. The algorithms have been coded in C language and experiments have been run AMD sempron 600 MHz PC equipped with 35 GB of memory, running windows XP professional..

The method is tested on Taillard bench mark problems Adams, Balas , and Zawack 10×10 .These are large size problems in job shop environment. The experiment was carried out on instances namelyTa1, Ta2, Ta3, Ta4, Ta5, Ta6 Ta7, Ta8 Ta9, Ta10,of size15×15. abz5 and abz6.

The results of various instances taken into account and their average of makespan are found out at same number of iterations 200. They are tabulated in Table 1. In the table.1 ‘n ‘denotes number of jobs; ‘m’ denotes number of machines, and $\check{C}_{max-}$ denotes $_{mean}$ makespan.

Table 1.

Bench mark	Size n×m	LPT	Local Search	Modified Pipeline hybridization
Ta1	15×15	1542	1262	**1256**
Ta2	15×15	1517	1267	**1253**
Ta3	15×15	1428	1242	**1248**
Ta4	15×15	1391	1198	**1198**
Ta5	15×15	1490	1246	**1236**
Ta6	15×15	1421	1265	**1262**
Ta7	15×15	1542	1253	**1251**
Ta8	15×15	1567	1251	**1229**
Ta9	15×15	1547	1308	**1298**
Ta10	15×15	1592	1277	1282*

n-number of jobs;m –number of machines; $\check{c}_{max}$-mean makespan

All makespan values of modified pipeline hybridization are smaller than local search and LPT values except fot Ta4 and Ta10 . Makes pan is equal to local seach in case of Ta 4 .

Comparison

The result of Modified Pipeline hybridization is compared with Kuo-Huang, Ching-Joug Liao, ACOFT-MWR and ACOFT-TR methods (Ant colony optimization combined with taboo search for the job shop scheduling) published in Computers &Operations Research 2006.The comparisons shown in table 2. The makespan of Modified Pipeline hybridization is better than ACOFT-MWR and equal to ACOFT-TR method for instant Ta5 and for abz5 our proposed method give better result ,for abz6 the makespan is equal to ACOFT-MWR and ACOFT-TR.

Figure1 shows Gantt chart of optimum makespan of Modified Pipeline hybridization of abz5. In which m1, m2……..m10 denotes the machine numbers and j001.j002…….j010 denotes the jobs.

Table 2

.Bench mark	Size n×m	ACOFT-MWR	ACOFT-TR	Modified Pipeline hybridization
Ta5	15×15	1237.5	1236.9	**1236**
Abz5	10×10	1235.8	1235.8	**1185**
Abz6	10×10	943	943	**943**

Gantt Chart:

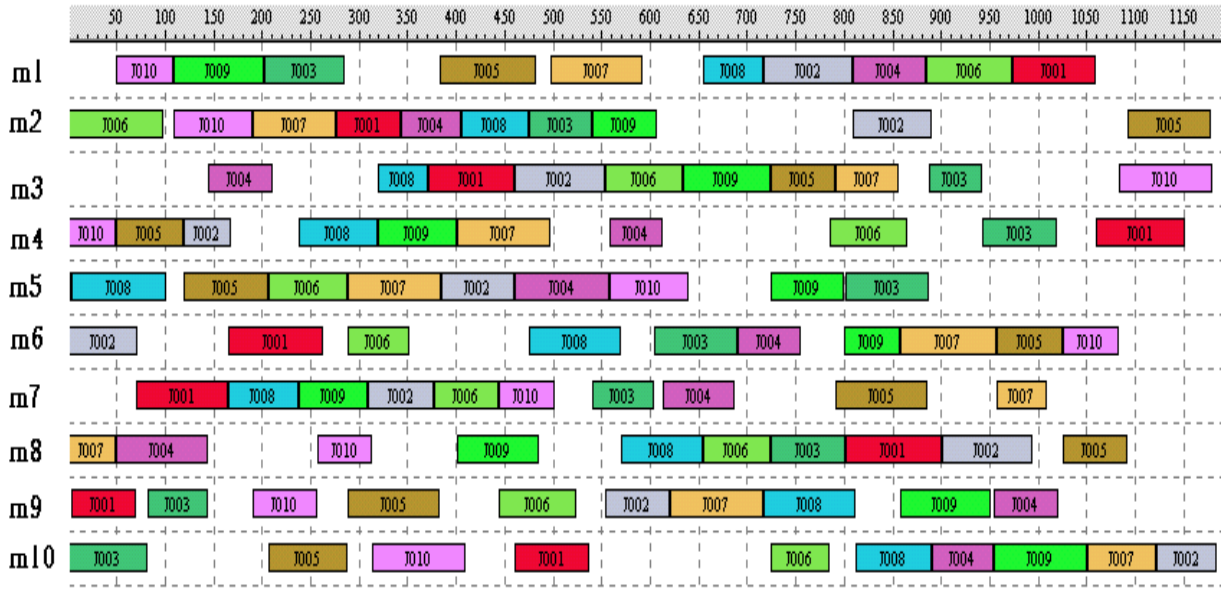


FIGURE 2: A instance of 10×10- makespan 1185

Design and Analysis: By Randomized complete block Design.

The significance of the difference between the mean of different samples tested

By randomized complete block **design**.. A table 3 is formed to analysis the experiments results. For example R.Pannerselvam et al[research methodology2006] In the table ,V_{ij} is the i th cputime of the jth problem size. The problem size is the factor which has effect on the responsible variable $V_{ij.}$ Let it be factor B. b is the number of problem. This is also known as the number of levels/treatments of the factor b. n is the number of data under each problem. This is also known as the number of replications under each level of the factor B.

Fixed factor is used in this problem because a specific set of treatment of a factor is selected with certainty.

The model of the Latin square design $V_{ij}=\mu+Bi+Tj+Pk+e_{ijk}$

Where μ is the overall mean;

V_{ij},is the observation with respect to the j th treatment of the factor and ith block. ;

Tj is the effect of the jth treatment of the factor

Pk is the effect of the k block representing period and

e_{ijk} is the random error associated with the I th block and the jth treatment of the factor..

Table 3: Latin Square Design:

Source of variation	Degrees of freedom	Sum of squares	Mean sum of Squares	F ratio
Between treatments	2	15559830.4	7779915.2	**1.5**
Between blocks	2	15559830.4	7779915.2	**1.5**
Error	6	30914447	51522407.9	

In the table3, the value of the calculated F ratio for the treatment is 1.5.

In all above three cases the calculated value is less than respective table values.

Hence the null hypothesis, Ho is rejected.

Inference: This means that there is no significant difference in terms of makespan between different METHODS ACOFT-MWR, ACOFT-TR, Modified Pipeline hybridization.

Conclusions

With a lot of research work has been carried out on the study of dispatching rule local search in job shop scheduling , there have been relatively few attempts to study the makespan using with pipeline hybridization of dispatching rule local search in job shop scheduling. In this work for each category 12 bench mark problems is iterated. Nearly 120 iterations are carried out. Medium

size like 10×10, large size problem like 15jobs and 15 machines problem can be solved using this program. Using LSD the difference in objectives is tested.

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DOWNSIZING AND ORGANIZATIONAL CHANGE SURVIVORS AND VICTIMS: MENTAL HEALTH ISSUES

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Abstract

Survivors and victims of organizational change are experiencing mental health issues after downsizing and organizational change. The purpose of this study was to determine whether white-collar workers were aware of major changes in corporate America and how these changes might affect them. The research question, "Do survivors or victims of downsizing or organizational change experience mental health issues after downsizing or organizational change?" This was the foundation of this study. This quantitative approach involved surveying 196 white-collar workers in two industries: manufacturing and health. An analysis showed that the literature has sensationalized the health-related problems because only about 20% of the people surveyed acknowledged there was a problem. The study provided insights into the health-related problems associated with downsizing or organizational change. Survivors and employees should speak about downsizing and organizational change, and it affects them and their family members financially, emotionally, and psychologically.

Keywords

Organizational Change, Downsizing

INTRODUCTION

In the past, most organizations operated as closed systems and ignored the signs of the environment. Organizations survived and sometimes thrived, even with their internal focus. The environment showed signs of stress and threats, but not everyone perceives a threat in the same manner. Organizations continued operations with a "business as usual" attitude. Many businesses failed, but others attempted to survive and find a way to meet environmental demands.

Trends and emerging values like technological advances, environmental emergencies, and global economy are shaping the world. They affect corporate culture and the employees who

support the culture. Environmental forces such as technology as well as political/regulatory, economic, and socio-cultural challenges, coupled with bad decision-making, a lack of resources and knowledge, and global competition, are all factors driving change. H. Scott (2004) explained, "In addition, three full decades of economic restructuring in the age of globalization, coupled with the rise of the 'New Economy,' have resulted in a complementary and fundamental shift in employment status" (p. 144).

Business as Usual

Although organizations continue to find a new label for their changing methods, this strategy is just a smokescreen for the ever-present financial goal of shareholder wealth. These cost-reduction methods have been used for many years and have been camouflaged with names like "restructuring," "termination," "permanent layoffs," "resource alignment," "downsizing," and "rightsizing." "Spurred by increasing worldwide competition and shareholder pressure to boost earnings, many companies are focused on improving productivity and quality, while reducing expenses" (Gilmore, 1994, p. 43). Noer (1993b) suggested that more leaders make a direct connection between layoffs intended to make organizations lean and mean, and increase profits and productivity. It appears that organizations have not changed their ways: They continue to employ age-old tactics or resist change. In effect, managers have not learned a thing!

The Choice to Downsize

Downsizing, the process of eliminating people from organizations and businesses, has become a significant characteristic of working life (Burke & Nelson, 1998; Hurrell, 1998; Miller, Casio, & Young, 1999). Molinsky and Margolis (2006) voiced the following about downsizing:

> Few people enjoy causing pain to others. Yet, this is precisely what business leaders must do when they make the difficult decision to downsize their organization. Downsizing represents

> one of the most challenging tasks that business executives can face, because of the human costs involved. (p. 145)

Why downsizing? Environmental forces constantly affect society and organizations alike. On the one hand, organizations can create a cycle whereby they can influence or control the circumstances in which they operate through the changes they make and the way in which they make them. However, organizations also can find themselves in a vicious spiral of decline and stagnation through an inability to control their own destiny with inconsistent and unsuccessful approaches to change. Burke (2005) indicated, “Organizational restructuring and downsizing are a complex and difficult task. A small but growing literature suggests that such changes fail to reach their objectives (usually financial) about half the time” (p. 21).

The recession of the 1970s forced managers to reevaluate their relationship with the external environment, requiring radical changes in the way that companies operated. The first choice was to downsize the workforce. “Common trends in modern work life include global competition and organizational changes such as downsizing and mergers. Such trends and many other characteristics of modern work may increase stress and influence the well-being of employees” (Appelberg, Romanov, & Honkasalo, 1993, p. 1315). Experience suggested that such decisions caused a downward spiral of staff morale, productivity decline, more staff cuts, the erosion of organizational services, and many health-related problems.

Organizational downsizing has become a ubiquitous feature of a great multitude of organizations throughout the industrialized and post industrialized world (Littler, 1998). Corporate America is downsizing by reducing its organizational structure to meet the global competitive marketplace. This phenomenon started in the 1980s with Ford, Chrysler, and General Motors pioneering this cost-cutting measure. Millions of jobs have gone by the wayside over the last

several years because of changing market conditions, lower productivity, and the inclusion of U.S. companies into the global economy. For example, Armstrong (2007) explained:

> As second-quarter numbers were filed in the last week of July, David Brennan sweetened AstraZeneca's bitter bottom line by announcing that he was upping the number of job cuts to 7,600, or 11 percent of its staff. A few days later, Johnson & Johnson's Bill Weldon joined in and said that the healthcare giant was "consolidating certain operations" and "standardizing and streamlining"-i.e., giving the boot to 4,800, or up to 4 percent, of its workers. (p. 1)

More recently, in 2005, "popular press headlines included the announcement of some 30,000 jobs cut at General Motors Corporation and 7,000 cuts at pharmaceutical giant Merck & Company Incorporated. The uncertainty of downsizing can be crippling" (Clair, Jackson, Dufresne, & Ladge, 2006, p. 131).

The losers are the employees who feel detached from the company: The feeling of community is absent. The term *corporate loyalty* has an archaic ring to it, and some consider it a betrayal of self. For such reasons, few individuals have any sense of belonging to something bigger and better than they already belong. For example, Piontek (2007) wrote:

> Call me old-fashioned. Call me a bleeding heart. Call me a babe in the financial woods. But whatever you call me, you're not going to quell the outrage I feel when I hear something like Citigroup's announcement that it was going to get rid of 17,000 workers. (p. 4)

In addition, A. Scott (2007) explained that cost cuts are probable at Pfizer Corporation. Speculation indicates there will be 10,000 people affected.

Society and organizations both seem to be in a period of transition, with many changes taking place in society on a daily basis. One might wonder where these changes will lead. Toffler (1980) referred to these periods of transition as “waves.” The dilemma created by such change is turbulence in society, grossly increasing uncertainty for individuals and organizations alike, and raising far-reaching questions concerning the limits of human adaptation (Pepper, Messinger, Weinberg, & Campbell, 2003).

White-Collar Workers: Victims and Survivors of Downsizing or Organizational Change

There are many reasons for downsizing. Many factors are evident, such as acquisitions and mergers leading to excess personnel once the operations have been consolidated, technological innovations resulting in productivity improvements without employee intervention, global competition leading to product and employee redundancy, and slow economic growth caused by a rapidly changing marketplace resulting in the need to be cost competitive (Vahtera, Kivimaki, & Pentti, 1997).

Downsizing often fails to meet intended goals (Edwards, 2000; McKinley, Mone, & Barker, 1998). “Financial measures, such as return on assessment, return on equity, sales to total assets, and ratio of market to book value equity, are negatively affected by the announcement of layoffs” (Sahdev, 2004, p. 166). In addition to negative and detrimental financial consequences, there is a ripple effect attached to organizational downsizing, for example, the high cost of paying employees their severance packages (Applebaum, Close, & Klasa, 1999). Downsizing also has a negative effect on learning and innovation because it breaks the informal networks that have developed over a period of years (Amabile & Conti, 1999; Reynolds-Fisher & White, 2000). Further disadvantages to downsizing include: 1) morale issues can surface, 2) growth is stymied, 3) productivity can go

down, and 4) employee health and behavioral problems can surface. When considering downsizing, management must find the right balance.

The literature supported the reality of this instability from the perspective of victims and survivors. On one side are the victim issues that arise from the downsizing. On the other hand, the survivors also are subject to health issues. Beyond depressed financial considerations and chaos, the downsizing process also exacts a heavy emotional and mental toll on employees. An added examination of factors attached to downsizing and termination revealed that:

> A loss of attachment, lack of information, and a perception of "apparent managerial capriciousness" as the basis for decisions on who will be terminated causes anxiety and an obsessive need for survival, which also leads employees to leave the company with bitterness and hostility. (Schweiger, Ivancevich, & Power, 1987, pp. 127-138)

On the surface, it may seem to be a plausible explanation for the survivor phenomenon. However, on further investigation, Schweiger et al. noted that at the time of implementation, the bitterness begins.

Toffler (1970) explained that to survive and avoid the possibility of future shock, individuals must develop and adapt. Individuals must find new ways to respond to what the future might hold because all of the old traditions of the past are now shaking under the hurricane impact of alternative thrust. Was this the prelude to downsizing? For the American worker, the thought of even the healthiest companies shedding pounds is not a pleasant one. Moskal (1992) explained that when employees receive downsizing notice, they face a traumatic future, but the survivors are equally affected. Lublin (1993) reported that during a recent downsizing at a company in California,

one man looked around the room and could not help wondering who the lucky ones were: the victims or the survivors.

Vahtera et al. (1997) noted that some common mental health issues surface during and after a downsizing or an organizational change. These include stress, self-esteem, and anxiety. Stress is "a dynamic condition in which an individual is confronted with an opportunity, demand, or resource related to what the individual desires and for which the outcome is perceived to be both uncertain and important" (Schuler, 1980. p. 189). Self-esteem is the individuals' perception of liking or disliking themselves and the degree to which they think they are worthy (Brockner, 1988). Anxiety is common when stressed. It helps individuals to cope with various tense situations (National Institute of Mental Health [NIMH], n.d.a). Finally, depression is another issue that may surface in the wake of downsizing, according to the (NIMH, n.d.b).

Study Results

On initial investigation, analysis, and examination, it may appear to business professionals and practitioners that organizational change is simple, straightforward, and an uncomplicated task. However, the victims and survivors of change know that such assumptions are not true. Following are examples of research studies conducted on this topic.

Survivor Issues

This section examines survivor issues after a downsizing or an organizational change process. A growing body of evidence has indicated that downsizing and related forms of organizational change can have profound effects on employees' health and well-being. Koeninger (2007) explained, "You don't want your people to die the death of a thousand cuts" (p. 1). Almost

every change triggers a reaction in employees and influences each person differently, directly affecting how the individual feels about his or her work. Questions arise out of uncertainty and lead to the inability of a person to cope with the required changes. The survivor literature provides convincing evidence that organizational downsizing has negative consequences for remaining employees (Beylerian & Kleiner, 2003; Brockner 1988; Devine, Reay, Stainton, & Collins-Naki, 2003; Kozlowski, Chao, Smith, & Hedlund, 1993; Makawatsakul & Kleiner 2003). The empirical evidence also shows that management-level survivors are not immune from the adverse effects of downsizing (Allen, Freeman, Russell, Reizenstein, & Rentz, 2001; Clifton, 1999; Goffee & Scase, 1992; Worrall, Campbell, & Cooper, 2000).

Survivor literature also suggests that workload increases during organizational downsizing (McHugh, 1997; Van Horn-Christopher, 1996). "This has specifically been found for middle managers (McConville & Holden, 1999; Newell & Dopson, 1996; Thomas & Dunkerley, 1999; Thronhill & Saunders, 1998). On the other hand, executive-level positions are usually associated with heavy workload demands (Cooper & Sutherland, 1992; Corneil, Barling, & Hepburn, 1998; Sutherland & Cooper, 1995; Worrall & Cooper, 1995).

According to Rice and Dreilinger (1991), the survivors of downsizing or organizational change display several reactions:

1. They have low morale. Survivors have the tendency to become depressed when their friends and associates leave the organization. They are not sure what to do to save their own jobs, so they maintain a low profile.
2. They become less productive. Survivors usually face worker overload because there are fewer employees to get the work done. They can get confused about their specific roles or responsibilities, as well as what management thinks about them.

3. They distrust management. Survivors have seen that competence and performance no longer equate with continued employment. Their so-called bargain with management has been unilateral, and they question management's trustworthiness.
4. They become excessively cautious. Survivors usually discontinue risk taking and decision-making, and innovation. Shifting the responsibility or playing it safe are the new rules of conduct.

Noer (1993b) suggested that the survivors and downsized victims typically experience a number of emotional reactions, including fear; sadness, depression, and quilt; betrayal, distrust, and anger; unfairness; and anxiety and stress.

Survivors have more confidence in the company's future than their own future; many are insecure about their jobs, and many are less secure about their careers. Kivimaki, Vahtera, Pentti, and Ferrie (2001) conducted a study of 550 municipal workers in a variety of jobs. This longitudinal study collected data before, immediately after, and 4 years after downsizing. The results revealed that downsizing predicted adverse changes in work characteristics and a long-lasting decline in self-related health. In combination, decreased job control, high job insecurity, and increased physical demands appeared to be the linking mechanism between downsizing and general health. Houston (1992) stated that a 1991 survey of 909 firms that were downsized found that 70% of the employees who still had their jobs were afraid of losing them. Boronson and Burgess (1992) reported, "When Wyatt Co., a health benefit-actuary consulting firm, surveyed 1,005 company executives last year, 58% reported that employee morale had worsened after layoffs and restructuring, and 37% agreed that keeping employees had become more difficult" (p. 43).

Pinola (1994) reported that Right Associates conducted a survey to determine the effect of downsizing on the employees who had remained with the organization. A total of 1,141 human

resource executives across the United States participated in the study. The results showed that the employees who had remained with the organization in transition exhibited a lack of confidence, distrust, high levels of stress, and doubts about their roles. In another survey at the Air Defense Systems Division of General Dynamics Corporation, Richey (1992) reported that 29% of the survivors indicated that their job performance had either decreased or decreased significantly. Richey's prior research revealed that organizations often enjoy an initial increase in productivity following downsizing. However, depression and lethargy usually follow.

Petterson, Hagberg, Hertting, and Theorell (2005) conducted a study of Swedish hospital personnel over an 8-year period. A regression analysis showed a downward trend in mental health and an upward trend in long-term leave. In addition, increasing trends of work demands accompanied by deteriorating mental health and decreasing time to plan work, showed the strongest association with increasing long-term sick leave. Job satisfaction and support also declined. There was a relationship between a lack of support and short-term sick leave.

Stress

Although employee terminations may help a company improve its efficiency and productivity, these layoffs have a negative impact on all employees. Faced with the possibility of a layoff, increased workload, the unknown, or an early retirement, many employees experience an increase in their stress level. Situations that results in stressful reactions affect virtually everyone. Stress can be good or bad, and by itself, it might not alter behavior. However, the cumulative effects of stress can reach an individual's coping threshold (Gilmore, 1994). Behavior can be altered at certain levels of stress given a person's ability to function is at risk.. The continued threat of possible victimization as the causative agent in deteriorating psychological health induces such stress-related illnesses as heart disease and ulcers (Leana & Feldman, 1988). Stress also can reshape an individual's entire disposition. It will alter feelings, perceptions, social interactions, well-being,

conduct, and almost all social or individual reactions. It is very damaging, and if it is not contained, it can lead to serious consequences.

Torkelson and Muhonen (2003) conducted a study to determine how men and women cope with stress during a period of change and how there is a relationship between coping strategies to health. Ninety-eight health care administrators participated in the study. Denial explained a significant proportion of variance in the health problems.

A study to systematically separate and combine the effects of organizational downsizing and work-related stress on a measure of health in survivors of layoffs included 240 men and 319 women ages 16 to 59 (Dragano, Verde, & Siegrist, 2005). The researchers found that although health associated with organizational downsizing was partly attributable to an increase in work-related stress, the findings showed an additional synergy produced by the combined exposure to both conditions.

Cheng, Chen, Chen, and Chiang (2005) administered a survey to 8,705 male and 5,986 female Taiwanese individuals' ages 25 to 65 years old from the general population. The findings reported that job insecurity was an important source of stress and that adverse psychosocial work conditions and poor health followed.

Anxiety

The feeling of anxiety can be infinite, and many emotions can surface during this trying period of uncertainty. The emotional, psychological, physical, and job-related problems of the survivors take their toll on the individuals and their families. The emotional and psychological toll is similar to the grieving associated with death and the devastation of fighting in military conflicts. In addition, Greenglass and Burke (2000) surveyed 1,363 nurses employed in hospitals. They found

that the heavier was the nurse's workload, the greater were their levels of emotional exhaustion, cynicism, depression, and anxiety.

Paterson and Cary (2002) surveyed 71 employees in an organization that had just downsized. Path analysis and a Q index of .992 offered preliminary support for the proposed model by showing that procedural justice and change anxiety explained the effects of change management procedures on acceptance of downsizing. Although distributive justice did not have the predicted direct effect on employee morale, it did help to explain the effects of procedures on the employees' acceptance of change and morale by helping reduce anxiety about the change.

Depression

Greenglass, Burke, and Moore (2003) conducted a study with 488 unemployed hospital nurses whose units had closed as the result of restructuring. Their findings suggested that anger, cynicism, and emotional exhaustion operationalized distress, indicating the importance of studying patterns of negative reactions and their consequences for depression. In another study by Greenglass and Burke (2001), 1363 nurses participated. The results indicated that in hospitals undergoing restructuring, workload is the most significant and consistent predictor of distress, as manifested in lower job satisfaction, professional efficacy, and job security. They also found that greater workload contributes to depression, cynicism, and anxiety.

Survivor Syndrome

The employees who remain on the job face some of the same symptoms as the survivors of catastrophic accidents. Survivor syndrome is a set of attitudes, feelings, and perceptions that occur in employees who remain in organizations following staff reductions (Devine, Reay, Stainton, & Collins-Nakai, 2003). In addition, the survivors suffer survivor syndrome because of the guilt of surviving (Conway, 1993). Gandolfi (2008) explained that survivor sicknesses include guilt,

positive inequity, anger, relief, and job insecurity. Organizational change also affects the health and well-being of downsized employees (Burke & Nelson, 1998b; Landsbergis, Cahill, & Schnall, 1999; Noer, 1993b).

Doherty and Horsted (1995) described survivor syndrome as the manifestation of many different emotions by the surviving employees after a downsizing. Research to date has suggested that the various reasons for survivor syndrome include a violation of the psychological contract, an act of unfairness by the management, or an organization's lack of vision (Sahdev, 2004). The survivors usually have feelings of guilt, stress, anxiety, distrust, fear, insecurity, and depression. The syndrome first affects morale and then influences the company's productivity and bottom line ("What About Employees," 1990).

Downsizing or Organizational Change Victims Study Results

Termination of Employment

Terminating employees, even when it is an absolute and obvious necessity, is extremely unpleasant for all involved. When one is on the receiving end, it is unnerving. At worst, the loser (victim) propels swiftly into a severe state of anxiety, stress, self-doubt, and depression. Devine et al. (2003) reported that individuals are called downsizing victims because the literature documents job loss and the psychological and physical consequences. Devine et al. explained that "based on a small number of empirical investigations it is accepted that those who lose a job through no consequence of their own become anxious, depressed, unhappy, and dissatisfied with life in general" (p. 110). The following event puts it all into perspective:

> Rene Kim was no neophyte when it comes to Wall Street layoffs. She had been through the wars at First Nationwide and Wells Fargo – more than once she had seen blizzards of pink slips dispensed and armies of colleagues shown the door. She never imagined she would have to endure that kind of thing at Charles Schwab Corporation. Schwab she had learned was a great place to work, filled with nice people you'd choose to spend the day with, and jobs you couldn't wait to begin each morning. As it turned out, it would have been a lot less gut wrenching to stay put at Wells Fargo. In the past three years, Kim has had to be as much an executioner as a brokerage vice president. She has orchestrated four rounds of layoffs (Morris, 2003, p. 80).

Stress

Using a stress and coping framework. Armstrong-Stassen (2005) conducted a study that "compared the reactions of executive-level and middle managers to the large scale downsizing of the Canadian federal government civil-service. Stressors, coping behaviors, job performance, and well-being were assessed over a 3-year period prior to, during, and following the downsizing" (p. 118). The results were when compared with executives. The middle managers perceived greater job insecurity, were more likely to use escape coping, and reported lower job performance and higher levels of health symptoms. Over time, both executives and middle managers reported a decline in perceived threat of job loss but an increase in sense of powerlessness, a decrease in the use of control-oriented coping strategies, and reduced job performance in the initial phase of downsizing.

Depression

Tsutsumi, Kayaba, Theorell, and Siegrist (2001) administered a survey to 190 Japanese workers in a plant suffering from economic hardship. The results revealed that the targeted support staff was more likely to have depressive symptoms. In addition, job strain, a combination of high demand and low control at work, was more frequent among assembly-line workers, whereas the combination of high effort and low reward was more frequent among support staff.

Self-Esteem

Another concern for employees affected by restructuring, downsizing, reorganization, or reengineering is the possible loss of self-esteem. Examined were two seemingly contradictory hypotheses about the impact of job loss on emotions. On the one hand, job loss is associated with increased feelings of anxiety, challenge, and aggression among terminated employees. On the other hand, job loss is associated with increased feelings of apathy, passivity, and depression among the survivors of change and staff reduction (Leana & Feldman, 1988).

In 2001, Wiesenfeld, Brockner, Petzall, Wolf, and Bailey surveyed the victims of layoffs on three occasions. All three studies supported the predictions that if negative reactions to aspects of layoffs are due to threatened self-integrity, the effects of those aspects should be reduced when the individuals have engaged in activities hat reaffirm their self-integrity.

Anxiety

Astrachan (2004) surveyed 119 laid off people. The results indicated a stimulated anxiety by the mere announcement that people in an organization were leaving and that the impact of anxiety was expressed differently, depending on the proportion of people staying and leaving the organization.

General Downsizing Issues: Study Results

Research on organizational downsizing has recognized that health risks to personnel may stem from growing work demands, perceived job insecurity, and reduced job control (Kivimaki et al., 2000; Landsbergis et al., 1999; Vahtera et al., 1997). Wiesenfeld, Brockner, and Thibault (2000) examined the predictors and consequences associated with managers' reactions to job layoffs. They found that relationships were mediated by self-esteem, procedural unfairness, and managers'

behaviors. The managers' subordinates, who engaged in less effective managerial behaviors, had negative perceptions of their work environment.

A study conducted by Hertting and Theorell (2002) to access changes associated with downsizing or reorganization in the health care sector found that protective and anabolic functions had suffered. Vahtera et al. (2004) surveyed 5,909 male and 16,521 female municipal employees. The results were that organizational downsizing might increase the absence and the risk of death from cardiovascular disease in the employees who keep their jobs (survivors of change).

The Purpose of the Study

The purpose of this study was to determine whether white-collar workers are aware major changes in corporate America and how these changes might affect them. The study aims to determine through survey and quantitative analysis of the results precisely the mental health issues survivors and victims experience after downsizing. One instrument developed by the researcher will be used to the gather data. One hundred ninety six white-collar workers in corporate American from two industries (health and manufacturing) in the Detroit metropolitan area participated in the study by completing hand delivered questionnaires. Three research questions will be tested using descriptive statistics such as: 1) frequencies, 2) percentages, 3) means, and 4) standard deviations to analyze the data. This study aims to provide data to corporate America, so they can make informed decisions on how to handle the downsizing and organizational change process.

Research Methodology

Population

The most practical approach to survey research is to select a group of individuals within a designated target population (Zikmund, 2003). This study samples and compares data from two industries. The first industry was the health industry and the second was a manufacturer. Both are in the Detroit metropolitan area.

Sampling

The participants were selected using convenience sampling because the researcher had know that these companies recently had experienced downsizing or organizational change. The researchers approached the two organizations, and the CEOs of both organizations gave their permission to conduct the survey. The sample consisted of 196 salaried white-collar workers. The researcher administered 128 questionnaires to a manufacturing company; 100 were completed and returned, giving a 78.1% response rate. In addition, the researcher dispensed 68 questionnaires to the employees at an osteopathic hospital; 51 were completed and returned, for a 75.0% response rate.

Survey and Instrument

Descriptive analytic survey was the basis for this study. The survey instrument was Likert-based (1-*strongly disagree* to 5-*strongly agree*) and yes/no questions that addressed several research questions. This section of the research paper discusses one of the research questions… "Do survivors or victims identify negatively with organizational change in terms of the personal effect on them or their families?"

Validity

To ensure validity, the questionnaire was submitted to a panel of experts to scrutinize its content and format, and to offer suggestions for revision. Five faculty members from Walden University sat on the panel. Based on the suggestions offered by these distinguished faculty members, modifications to the content, format, and directions were made.

Reliability

The researchers conducted a test-retest method for reliability of the instrument. Fifteen employees at a manufacturing company located in the Detroit metropolitan area who recently experienced organizational change participated in two tests 15days apart. The test resulted in a correlation coefficient (r = .98) that was significant at the .005 level. The instrument was not subject to random error.

Data Analysis

Descriptive statistics, specifically frequencies, percentages, means, and standard deviations were used to analyze the data.

Results

Question 9 sought responses from the participants regarding whether they had experienced emotional, physical, or psychological problems because of the change in their organizations. A review of the literature pointed out that many survivors of change experience health problems (Pinola, 1994), yet 72.8% of the respondents in the study replied negatively to this question. It might be useful to note that 19.2% indicated that they experienced health problems and 7.9% were undecided. The literature seemed to sensationalize the health related problems because only about 20% of the people surveyed in this study acknowledged it was a problem.

Question 8 of the survey asked the participants if they had experienced stress due to the change in their organization. It should be noted that over half of the total respondents (64.9%) selected “yes.” These responses were supported by the literature in that stress in the workplace is

increasing and causing productivity problems (Gutknecht & Keys, 1993; Solomon, 1993). The literature and the results of this survey question seemed to be in agreement that health-related issues are associated with downsizing or organizational change (see Table 1).

Table 1

Participants' Responses to Organizational Change and Personal/Family Effects: Questions 8 and 9

Question 8. I have experienced stress due to the organizational change in my organization.

		Frequencies by response type		
Organizational type:	*N*	Yes	No	Undecided
Manufacturing	100	68.0	28.0	4.0
Medical	51	58.8	33.3	7.8
Total	151	64.9	29.8	5.3

Question 9. I have experienced emotional, physical, or psychological problems due to the organizational change in my organization.

		Frequencies by response type		
Organizational type:	*N*	Yes	No	Undecided
Manufacturing	100	19.0	73.0	8.0
Medical	51	19.6	72.5	7.8
Total	151	19.2	72.8	7.9

Note: Frequencies shown in percentages

In Question 10, the respondents were asked whether members of their families had experienced stress, that is, emotional, physical, or psychological problems, due to the organizational change in their organizations. Over half the respondents (61.6%) replied either *strongly disagree* or *disagree*. Also, it is important to note that 22.5% of the total respondents remained neutral and

responded *neither agree* or *disagree*. The literature indicated that families suffer greatly from organizational change and they experience the same emotional and psychological problems as the survivors (Symonds et al., 1985). The results of this question indicated that the family members of the participants were not experiencing health-related problems as the result of downsizing or organizational change (see Table 2).

Table 2

Participants' Responses to Organizational Change and Personal/Family Effects: Question 10

Question 10. Members of my family experienced stress, emotional, physical, or psychological problems due to the organizational change in my organization.

		Frequencies by Response Type				
Organizational Type:	*N*	SD	D	NA/D	A	SA
Manufacturing	100	19.0	42.00	22.0	16.0	1.0
Medical	51	25.5	37.3	23.5	11.8	2.0
Total	151	21.2	40.4	22.5	14.6	1.3

Note: SD = strongly disagree, D = disagree, NA/D = neither agree nor disagree, A = agree, and SA = strongly agree

Note. Frequencies are shown in percentages.

General Implications

The following are speculations of a general nature from data gathered in this study.

1. If downsizing continues, there may be some drastic changes in lifestyles previously enjoyed by the two-wage earner families. It is possible that one-wage earner families will lose employment or that wage levels from past jobs will not be realized in a new job.
2. If downsizing continues, more individuals will be joining the contingent workforce as jobs will become more and more unavailable.

3. More people will become consultants as jobs become more and more scarce.

Organizations are looking at their value-added objectives and shedding departments such as personnel and information systems, so there may be some previously employed people fulfilling the tasks that companies used to outsource.

Recommendations

Organizations and survivors can use the following recommendations for action before, during, and after the process of downsizing or organizational change. Such involvement could lead to fewer health-related problems, less devastation during downsizing, a smoother transition of the change process, and better preparation to combat the problems of the survivors.

People

The following recommendations could help individuals (i.e., employees and survivors) and organizations to develop a completely new mindset and become proactive about their lives and decisions. Individuals should monitor the health of their companies and acquire the knowledge to recognize symptoms that will result in change within their organizations. The employees should pay attention to the top of their organizations, such as key executive layoffs, mergers and acquisitions, or divestitures. People should pay attention to the signs of the environment and recognize that this era of rapid change requires new expectations. Individuals should investigate and find out about the educational and skills requirements of today's workers and prepare themselves accordingly. Employees should speak to family members and share the organizational climate with them. All family members should discuss the subject of organizational change and discover how it could affect them. A recent study determined that family members suffer the same emotional, physical,

and psychological effects as the victims or the survivors of organizational change (Leana & Feldman, 1990). Finally, individuals should save money in case of a job loss.

Organizations

According to Stephanie Beer, operations director at Accor Services (as cited in Blyth, 2003), It's useful to have counselors on site and a helpline in place to deal with employees' concerns and help to fast-track them back into a positive state of mind (¶ 4). Also, managers need to rebuild the team and develop a new culture (¶ 7) . In addition, Kuhn and Stout (2004) suggested that organizations should minimize the risk of discrimination charges, demonstrate respect for workers and survivors, and be sure that the employees enter into the agreement freely. After downsizing, there is still much work to do.

Ramsey (2004) recommended the following protocols:

1) Make a big deal out of full disclosure.

2) Radiate confidence and a "we'll get through this" attitude.

3) Show you truly care about former co-workers who have been let go and about those still on the job.

4) Remind employees that the mission of the organization is still the mission.

5) Rally your staff or crew by emphasizing the best insurance against further layoffs is to make themselves more productive, more profitable and more indispensible to the overall organization.

6) Provide additional training and growth opportunities for employees.

7) Do whatever you can do to lighten the load of your downsized workforce that is over-stretched and over-stressed.

8) Make your case to the front office for retaining all remaining employees.

9) Take care of yourself so you have the resilience and energy to offer others all the support they need during tough times. (p. 5)

Finally, Chang (2003) explained, “Honesty is the best policy when it comes to managing in a post-layoff environment” (p. 10).

Alternative to Downsizing

Organizations often forget about the potential consequences from their stakeholders in the rush to downsize. For example, one consequence is that politicians consider laws to stop plant closings. Another consequence is a new assertiveness by unions. Finally, the community stops buying products and frowns on an organization that does not stand by its workers (Abbasi & Hollman, 1998). Also, downsizing does not necessarily result in increased financial performance or a rise in productivity. There must be another way to competitiveness. Perhaps, an alternative to downsizing or organizational change is feasible. According to McCarthy and Millen (1994), reducing the workforce does not produce efficiency and bears no necessary relationship to greater customer satisfaction or improved business processes. Fundamental changes in business practices can change these results. There are alternatives!

Organizations can improve results through fundamental changes in the way they conduct business. Cutting costs elsewhere or developing products or services might be attractive considerations. Increasing labor productivity often is an effective alternative to downsizing. Organizations can benefit from increased productivity. Increasing productivity and paying higher wages helps to balance the conflicting demands of the workers and the managers. In addition, companies could retrain employees for other jobs. By matching employees with internal jobs, companies can save severance costs. Management should provide workers with the opportunity to

acquire new skills before deciding to downsize the workforce. Finally, employees may agree to accepting a wage reduction in return for employment; being seconded to neighboring companies; or taking voluntary unemployment, but with a guaranteed return date (Rayburn & Rayburn, 1999).

Conclusion and Remarks

The literature suggested that downsizing or organizational change leads to health-related issues. The literature review research results did verify that the downsizing process creates a great deal of stress in the workplace (Gilmore, 1994; Iverson & Sabroe, 1998; NIMHa, n.d.; Pinola, 1994). In addition, the survivors of downsizing exhibit anxiety as they try to come to terms with the loss of their colleagues (Schweiger et al., 1987; Vahtera, et al., 1997). Employees grieve for colleagues who have left, and they experience uncertainty and anxiety about who will be the next person to lose his or her job. Finally, depression sets in, and a downward spiral begins (Rice & Dreilinger, 1991; Greenglass & Burke, 2001; Greenglass et al., 2003).

The study results suggested that downsizing and organizational change produced very few emotional, physical, or psychological issues among the respondents. However, about 20% of the victims and survivors did acknowledge that they experienced health-related issues. Depending on the size of the organization, this can be a substantial percentage of the workforce. , Therefore, further studies might be appropriate, and some suggestions to assist these stricken employees might be helpful. For example, what is available for the victims or survivors? Help from family members is critical at this point. Eriebach, Amundson, Borgen, and Jordan (2004) suggested that there is a need for clear communication among people at all levels of the enterprise. Counselors or employee assistance programs can play a key role by helping to establish communications, monitor the effectiveness of the dialog, and attend to the employees' health-related issues. They indicated:

> In addition to individual counseling, participants in our study were very positive about counselor-led workshops in which they had the opportunity to discuss and validate their emotional reactions. These workshops presented an opportunity for both emotional validation and action planning (Borgen, Pollard, Amundson, & Westwood, 1989). Counselors can help survivors examine existing resources and develop new resources for coping. Action planning can include both a focus on the current situation and a longer-term perspective.
>
> On an organizational level, counselors can facilitate the transition through team-building workshops for new colleagues. Survivors benefited somewhat from seeing evidence that their organization was concerned about worker well-being, but they did not see actual changes in coworker relations because of workshops. It is likely that onetime workshops cannot address the complex issues new coworkers face as they adapt to the downsized organization. Issues of damaged trust in the organization and its impact on coworker relations must be explicitly addressed. Furthermore, in order to be effective, team-building efforts must be supported and followed up by managers. (p. 18)

Wise (1993) explained that employee assistance programs are helping employers to manage downsizing, restructuring, acquisitions, and divestitures, and are reviewing the use of mental health care. Additional studies are recommended to assess these health-related issues because the data gathered seems to be contrary. The literature indicated there are health-related downsizings and organizational change issues, but this study found otherwise. Finally, at least 20% of the respondents expressed that they were experiencing health problems; in large companies or in depressed economic times, this could be a potential problem.

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A NOVEL APPROACH FOR EXTRACTION OF DESIGN FEATURES USING DXF FILES

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Abstract

Feature recognition is the key linking element between CAD and CAPP. Different CAD/geometric modeling packages store the design related information in their own databases. Structures of these databases are different from each other. Automatic Feature Recognition (AFR) is the process of extracting such feature data for use in the other stages of product life cycle viz., process planning, CNC code generation and inspection etc. This paper presents different algorithms to extract the design data stored in the form of Data Exchange Format (DXF) files and to store such data in an orderly form. . A software program is developed in 'C++', for extraction of the features (entity) data from the DXF file. The flow chart of the program is given as an appendix. The paper demonstrates the working of the algorithms using a set of examples.

Keywords

CAD/CAPP/CAM, CIM, Feature extraction, Feature recognition

Introduction

The link between Design and manufacturing represents a vast field of research and its growth is crucial to the success of the CAD/CAM industry. While most of the CAD process is generally recognized as an exercise in "Composition", i.e., to make geometric shapes from primitives, CAM processes are characterized by "Decomposition", i.e., extracting sets of surfaces or features to be able to be machined by a set of tools and machining conditions. An intelligent interface between CAD and CAPP systems is imperative because the CAPP systems depend on correct data obtained from CAD systems to perform precise process planning. Feature recognition techniques provide such a connection between CAD and CAPP. However, CAD and CAPP systems form different databases. While CAD databases are usually geometry-based, consisting of geometric primitives such as points, lines and arcs, CAPP systems are feature-based such as faces, cylinders, grooves or pockets [3]. It could be said that the CAPP systems describe in terms of

manufacturing features, whereas CAD describes parts by their solid model or design features. One of the solutions for these problems between CAD and CAM is the automatic feature recognition technique.

Automated feature recognition can best be facilitated by CAD systems capable of generating the product geometry based on features there by making it possible to capture information about tolerance, surface finish and so on. However such CAD systems are not mature yet and their wide usage in different application domains remains to be seen [1]. The design and development of CAM tools has not kept the pace with the growth in CAD techniques. Hence there is enormous scope for research to fill this gap. Automatic feature recognition is the first stage in such effort.

This work is basically designed for the turned components. Owing to the fact that such components are symmetrical about their axis, only the 2-D profile of the upper half of the component has to be designed in any CAD environment and be converted to DXF structure.

LITERATURE REVIEW

Research in the area of feature Data extraction and recognition has emerged from the need to utilize the rapid advancement in CAD. Many different approaches to the problem of feature recognition have emerged which are widely reported in the literature and described by Shah [1] and later Sabin et al.[2,3]. The pioneering work in this area was that of Grayer[4] and Kyprianou [5] , whose research set the scene for much of the subsequent work in this area. Since then several approaches have emerged such as “Alternating sum of volumes (ASV)”, developed by Woo [6]. Srinivasakumar et al.[7] have used IGES format for automatic extraction and recognition of part features directly from a CAD model. Pande and Prabhu [8] have presented a paper on the design and implementation of data extraction from DXF and tool selection for rotational components manufactured on Automats. Seker and Aslan[9] have used DXF format for data extraction and

feature recognition for prismatic parts to be machined in milling machines. Yakup Yildiz et al.[10] has developed an automatic feature recognition system for rotational parts using DXF files.

DXF FILE FORMAT

Data Interchange Format (DXF) is a common structure, which is widely used for this purpose. DXF files are standard ASCII text files with a file type of .dxf and specially formatted text. These files can be easily translated to the formats of other CAD systems or submitted to other programs for specialized analysis. The overall organization of a DXF file is as following [11].

1. HEADER section - General information about the drawing is found in this section of the DXF file. Each parameter has a variable name and an associated value.
2. TABLES section - This section contains definitions of named items.
    - Linetype table (LTYPE)
    - Layer table (LAYER)
    - Text Style table (STYLE)
    - View table (VIEW)
    - User Coordinate System table (UCS)
    - Viewport configuration table (VPORT)
    - Dimension Style table (DIMSTYLE)
    - Application Identification table (APPID)
3. BLOCKS section - This section contains Block Definition entities describing the entities that make up each Block in the drawing.
4. ENTITIES section - This section contains the drawing entities, including any Block References.
5. END OF FILE

A DXF file is composed of five groups viz, HEADER, BLOCKS, TABLES, OBJECT and ENTITIES each of which occupies two lines in the DXF file. The first line of a group is a group code, which is a positive nonzero integer, right-justified and blank filled in a three-character field. The second line of the group is the group value, in a format that depends on the type of group specified by the group code. However, all the feature related information is present in the ENTITIES section of the DXF file. This section consists of all the geometric information pertaining to the design features (entities) used in the drawing viz., LINE, POLYLINE, and ARC etc., lines may be parallel, perpendicular, inclined to the axis or it may be curved. The 2D profile shown in the Figure 1. has 15 different features including the axis. Even though it is possible to draw the given profile in different ways in CAD environment, lines and arc commands are used individually to test the algorithm. Figure 2 shows the 3D view of the profile. The ENTITIES section of the DXF file for the given 2D profile is presented in the Table.1**.** In the actual DXF file all the data (DXF codes and respective values) are in a single column one after the other.

DXF code '0' in the first row of the first column in Table.1 indicates that a new section is started. Name of the section (ENTITIES) is available in the fourth row of the first column. X, Y, and Z coordinate values of different points are available after DXF code 10, 20 and 30 respectively.

3. DRAWING:

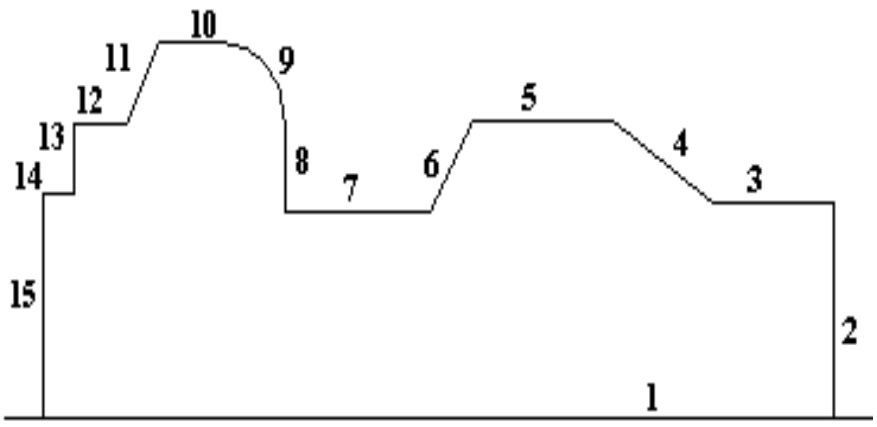

Figure 1: 2D profile of the upper half of the part

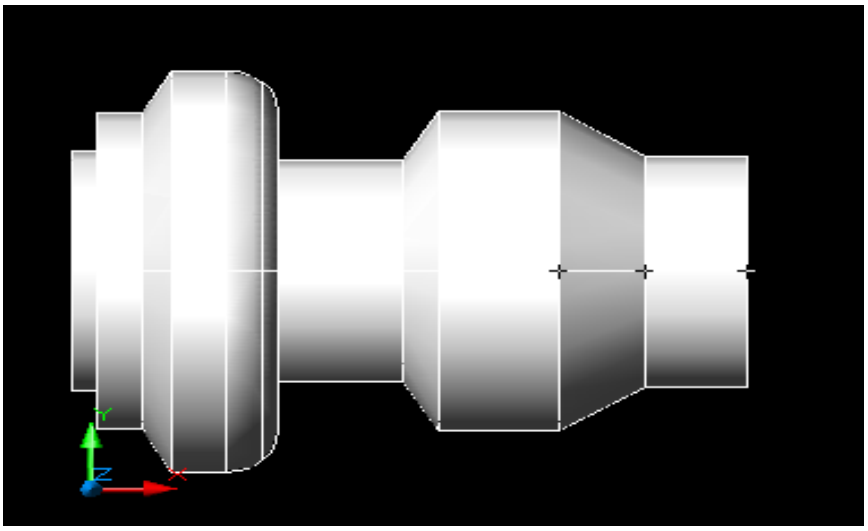

Figure 2: 3D model of the given part

0	0	30	11
SECTION	LINE	0.0	3.671368189755412
2	5	11	21
ENTITIES	26E	8.99640047584171	5.278417857517069
0 (*ENTITY TYPE*)	330	21	31
LINE	1F	4.474337391290418	0.0
5 (*HANDLE*)	100	31	0
26D	AcDbEntity	0.0.	ARC
330	8	. . . .	5
1F	0	10	275
100	100	8.99640047584171	330
AcDbEntity	AcDbLine	20	100
8 (*LAYER NAME*)	10	4.474337391290418	AcDbEntity
0	10.48603797718033	30	8
100	20	0.0	0
AcDbLine	2.387149477465072	11	100
10 (*X Co-ordinate*)	30	7.763596212960692	AcDbCircle
0.19554398309355	0.0	21	10
20 (*Y Co-ordinate*)	11	5.278417857517069	2.917989117519027
2.387149477465072	10.48603797718033	31	20
30 (*Z Co-ordinate*)	21	0.0	5.278417857517069
0.0	4.474337391290418	…..	40 (*radius of Arc*)
11	31	AcDbLine	0.753379072236384
12.90028120333363	0.0	10	100
21	AcDbLine	3.671368189755412	AcDbArc
2.387149477465072	10	20	50 (*Initial angle*)
31	10.48603797718033	4.405905772709047	0.0000000000000

0.0	20	30	51	(*Final angle*)
	4.474337391290418	0.0	90.0	

Table 1. **Exerts of DXF file (Entities Section)**

ALGORITHM FOR DATA EXTRACTION

Step1. Save the AutoCAD drawing as .dxf

Step2. Execute the developed file reading program to find the word "ENTITIES". (This section contains all the geometric information of entities used in the drawing)

Step3. Find the type of entity, by which the part profile is drawn (POLYLINE, LINE and ARC etc.,). Refer to Appendix

Step4. If the entity is POLYLINE, then execute subprogram 1.

Explanation: This subprogram extracts the X and Y coordinates of the vertex points (values below the DXF codes 10 and 20 are the coordinate values of X and Y respectively). Refer to Figure4 in the Appendix. The DXF code 42 indicates that the feature is Arc.

(Else)

Step5. If the entity is LINE, then execute a subprogram 2.

Explanation: This subprogram extracts the X and Y coordinates of the starting and ending points of the line. Values below the DXF codes 10 and 20 are the coordinate values of X and Y of the starting point while the values below the DXF codes 11 and 21 are the values of X and Y of the ending point of the line respectively. In the case study given here we had used the line command, the details of which are shown in the Table 1.As the DXF file runs in very large number of lines, only some exerts of the entities section are given. The profile had been

drawn with random decimal coordinate values. This is done to confirm the ability of the program to read the decimal values and present the output file (Drawout) with limited (4) decimal values as shown in Table 2. For the flowchart refer to Figure5 in the Appendix.

(Else)

Step6. If the entity is ARC, then execute subprogram 3.

Explanation: The values below the DXF codes 10 and 20 represent the coordinate values of the center point of the arc. And the value below the DXF code 40 is the radius of the arc. The values below the Flags 50 and 51 are the starting and ending angles of the arc. The same details for the given profile have been shown in the Table 2. For the flowchart refer to Figure6 in the Appendix.

Step7. Repeat steps 3-6 until it reaches 'ENDSEQ', i.e. the end of the entity section.

RESULTS & DISCUSSION

The program is capable of extracting the details of the entities viz., POLYLINE, LINE and ARC. It saves the details of these entities in an output file (Drawout) as given in the Table 2. The first column of the table represents the type of Entity and in this case we had used only two commands i.e., line and arc. The X co-ordinate values of the initial point are given in column 2 and the corresponding Y co-ordinate values are given in column 3. Column 4 and 5 represents the X and Y coordinate values of final points of the lines. In case of Arc, the co-ordinate values of the centre of the arc are given in column 2 & 3. Value in column 4 represents the radius of the arc. Following it, the starting and ending angles of the arc are provided. Column 6 represents the type of line (Horizontal or Vertical). The logics used to determine the types of lines and their orientation are given in Table 3. The orientation of the lines is made depending on the initial and final coordinates of the corresponding entities.

Entity	x1	y1	x2	y2	Type
line*	0.1955	2.3871	12.9003	2.3871	Hztl line
line	10.4860	2.3871	10.4860	4.4743	Vrtl line
line	10.4860	4.4743	8.9964	4.4743	Hztl line
line	8.9964	4.4743	7.7636	5.2784	Incl line
line	7.7636	5.2784	6.0171	5.2784	Hztl line
line	6.0171	5.2784	5.4692	4.4059	Incl line
line	5.4692	4.4059	3.6714	4.4059	Hztl line
line	3.6714	4.4059	3.6714	5.2784	Vrtl line
arc	2.9180	5.2784	0.753379**		
	Initial Angle: 0.0000				
	End Angle: 90.0000				
line	2.9180	6.0318	2.1304	6.0318	Hztl line
line	2.1304	6.0318	1.7023	5.2613	Incl line
line	1.7023	5.2613	1.0517	5.2613	Hztl line
line	1.0517	5.2613	1.0517	4.5599	Vrtl line
line	1.0517	4.5599	0.6750	4.5599	Hztl line
line	0.6750	4.5599	0.6750	2.3871	Vrtl line

* - Axis line ** - Radius of the Arc

(V*alues are being limited to 4 decimal places)*

Table 2. Output file (Drawout) showing the type of Entities and their coordinate values for the given profile

Logic	Line	Direction	Type of Representation
If y1=y2 and x1<x2	Horizontal	→	hztl line
If y1=y2 and x1>x2	Horizontal	←	hztl line
If y1<y2 and x1=x2	Vertical	↑	vrtl line
If y1>y2 and x1=x2	Vertical	↓	vrtl line
If y1<y2 and x1<x2	Inclined	↗	incl line
If y1>y2 and x1<x2	Inclined	↘	incl line
If y1>y2 and x1>x2	Inclined	↙	incl line
If y1<y2 and x1>x2	Inclined	↖	incl line

Table 3. Different Logics used to determine the line Property

CONCLUSION

An algorithm for the extraction of design feature data from DXF files is demonstrated with an example. The algorithm gives out the feature data even when the profile is drawn with a combination of commands viz., LINE, POLYLINE and ARC. The goal of the research is to develop an automated process planning system for the turned parts.

The output of this program shall be utilized as an input to the next stage of process planning.

The program was developed in 'C' language.

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APPENDIX

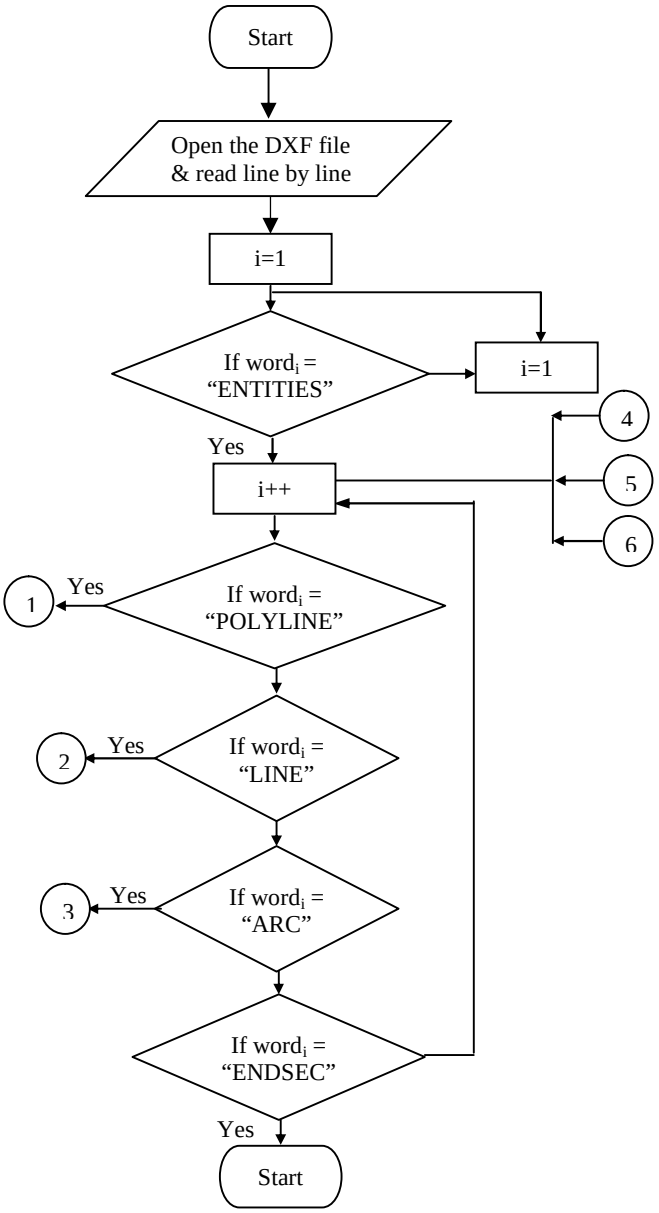

Figure3: Flow chart showing the overall structure of the Extraction Program

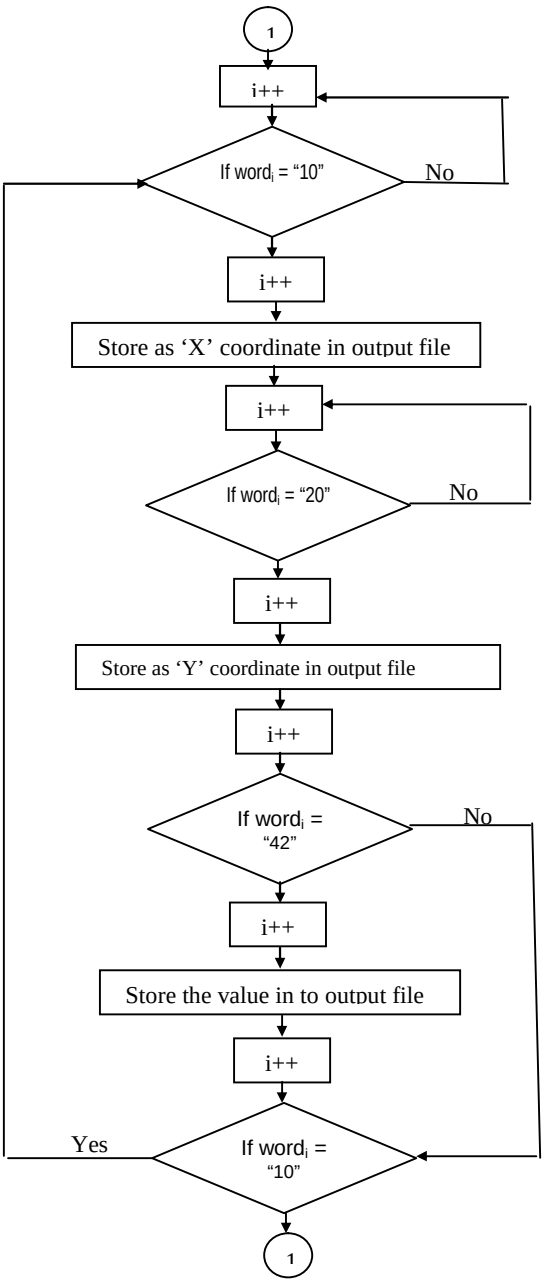

Figure4: Flow chart for feature extraction of profiles drawn by POLYLINE command

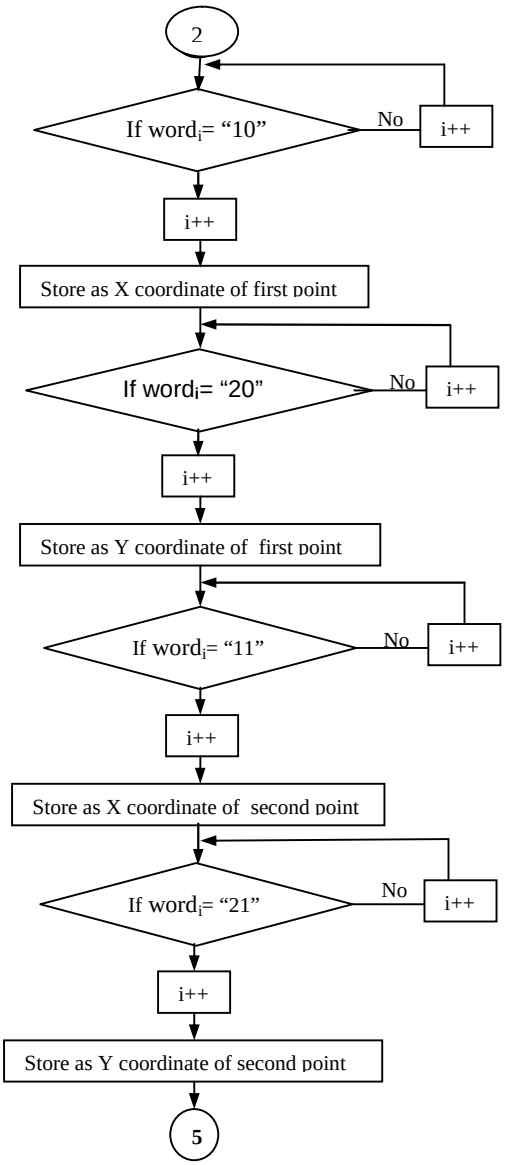

Figure5: Flow chart for feature extraction of profiles drawn by LINE command

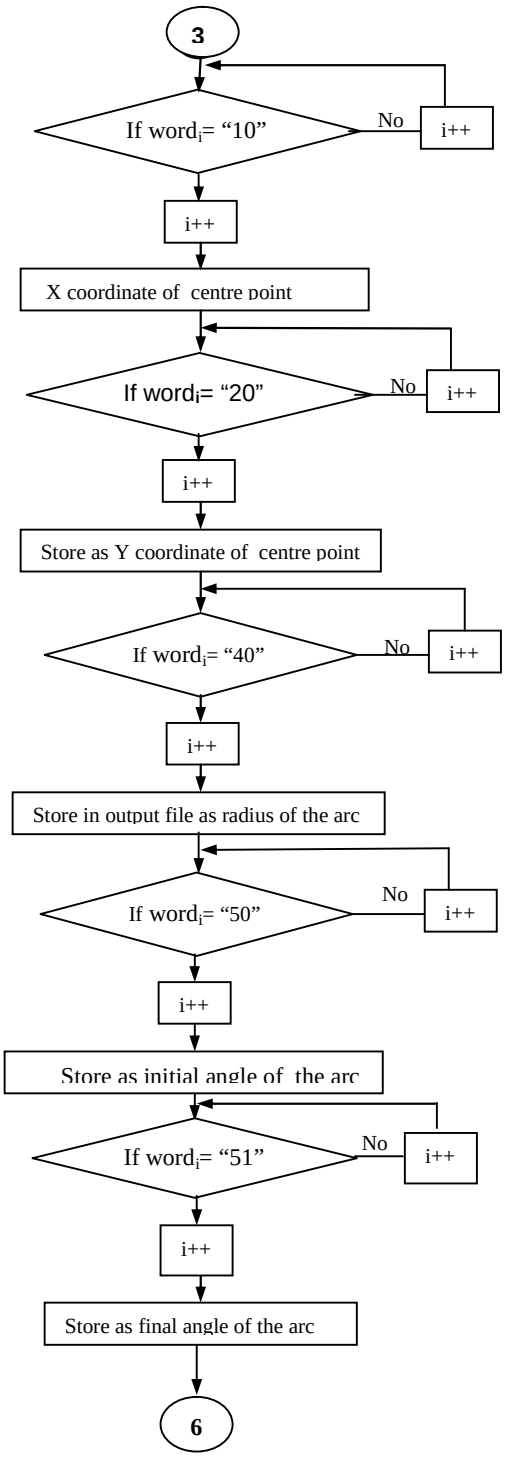

Figure6: Flow chart for feature extraction of profiles drawn by ARC command

COMMITMENT TO THE GREEN MOVEMENT BY ORGANIZATIONS AND INDIVIDUALS, IMPACTS OF ORGANIZATIONAL CULTURE, AND PERCEPTIONS OF IMPACTS UPON OUTCOMES

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Abstract

In this research, we find support for a proposed set of linkages among individual and organizational green orientation, organizational culture, employee perceptions of organizational green orientation, Quality Management (QM) Maturity, and outcomes, in terms of positive impacts of the green movement and organizational performance. Specifically, we find that in organizations which are oriented toward the green movement and which have organizational cultures which are supportive of the green movement, employees who believe that their organizations are aligned with the green movement are more likely to also see the organization as higher in QM Maturity. In turn, outcomes in terms of overall performance and positive impact of the green movement will also be higher.

Keywords

Green movement, Organizational Culture, and Perceptions of Impacts upon Outcomes

Introduction

In this research, we find support for a proposed set of linkages among individual and organizational green orientation, organizational culture, employee perceptions of organizational green orientation, Quality Management (QM) Maturity, and outcomes, in terms of positive impacts of the green movement and organizational performance. One stimulus for our work has been widespread recent discussion of the need to shift attention in

QM programs to issues of *sustainability*, a concept which is potentially central to both QM and the green movement.

The Green Movement

Recent events, and especially rising gasoline prices, a depressed housing market, and instabilities in the world economy, have led to considerable discussion of the current status of the "green movement", a phenomenon which has appeared over the past 20 years (Stafford, 2003). It encompasses areas such as "green buying" by consumers (Mainieri, et al., 1997), Environmentally Preferable Purchasing (EPP) by government agencies and ultimately by organizations in the private sector (Elwood & Case, 2000), Environmentally Benign Design and Manufacturing (EBDM) (Newsdesk, 2006), and Socially Responsible Investing (SRI) (Blodget, 2007). In each case, discussion has centered on purchasing, manufacturing, and investing in ways which are environmentally beneficial. Historically, emphasis has been placed on insuring that EPP products are attractive to consumers (Ottman, Stafford & Hartman, 2006; Dale, 2008) and insuring that organizations have sufficient incentives to behave in environmentally-constructive ways (Elwood & Case, 2000).

In contrast, a second stream in the literature has suggested that the "green movement" may be in decline. Specifically, one of the "Current Issues in the Greening of Industry" (July 2007) suggests that the current "new-found environmental ethic" may be somewhat ephemeral and that "… corporate greening could go bust" in ways analogous to other recent fad-like phenomena. Moreover, Stafford (2003) points out that "… green issues as a whole appear to be taking a back seat to concerns of terrorism, war, and the economy." However,

Dale (2008) points out that, with soaring energy prices pushing up the price of mainstream goods, green products are becoming just as -- or even more -- affordable these days. Stafford also notes that concerns about oil could lead to a movement to reduce dependence on oil in the U.S., and thus foster this aspect of the green movement.

During this unsettled period, one important set of questions centers upon consumers, who, themselves are employees as well and the issue of determining the extent of their commitment to the green movement. We have recently (Li, Hartman & Zee, 2008) reported our initial work to design a scale to measure commitment to the green movement. Our emphasis was on development of an instrument which would tap the key concerns of the green movement. Wikipedia, the free encyclopedia, points out that the Green Movement originated from Green Politics, a political ideology. Greens, the supporters of the green movement, advocate green politics and place a high importance on ecological and environmental goals. The greens share many ideas with the ecology, conservation, environmental, feminist, and peace movements; civil liberties, social justice and nonviolence are the issues they focus upon as well. We reported encouraging initial findings which suggest that the instrument can be used to examine consumer/employee commitment.

Environmental friendliness and sustainability are the major concerns of green products, green manufacturing and service, and green organizations (Liu & He, 2005). All of the green activities, such as reducing waste, using harmless materials, and providing organic food can be placed under the umbrella of greening. Providing a clean, ethical and safe environment to human beings and all creatures is the goal of green movement, and is one

which potentially requires the efforts of all the people, industries and governments on the earth (Grewe 2002; Holden 2004; Patulny & Norris, 2005; Tiemstra, 2003).

Total Quality Management (TQM)

In this research, we consider whether there may be linkages between employee commitment to the green movement and that same employee's belief that his organization has implemented TQM programs in a quality way. Our initial interest was in the area of Quality Management Maturity and had its origin in a review of literature which has hailed the advent of Quality Management (QM) as offering great potential as a solution for recent problems with productivity and quality in US corporations. In turn, declining quality and productivity were offered as key offenders where US firms were seen as losing competitive advantage, especially to Japan (e.g., Bowen & Lawler, 1992; Fuld, 1992; Lawler, Mohrman & Ledford, 1992; Shearer, 1996). However, we noted other literature which has suggested that QM programs, at least as initially introduced in a number of U.S. organizations, have represented anything but a panacea. Moreover, in at least some cases, efforts to introduce quality programs have met with problems and failures (e.g., Choi & Behling, 1997; Klein, 1991; Parker, 1991). We wondered why such differences in organizations' experiences with quality programs could have occurred. In recent research, we have shown that an important underlying issue may involve the *depth* or *qualitative aspects* of the organization's experience with QM, a term referred to as QM Maturity (Fok, et al., 2000). Specifically, we reported that it is important to distinguish between the *length of time* an organization has reported that it has been "on QM," and the quality of its implementation.

Moreover, we have contended that QM Maturity may be important in understanding the impact upon related systems in organizations differing in QM Maturity. In terms of ideas from socio-technical systems theory, for example, we recognize that organizations must be understood as complex and highly interconnected bodies of social and technical systems. Moreover, changes to one or more of the systems will cause change throughout the systems comprising the organization (Jacques, 1952; Trist & Bamforth, 1952). From this perspective, it appears likely that, under increasing QM Maturity, or as QM is implemented with more *depth* (i.e., more comprehensively, in ways which impact more parts of the organization, and the like), we should expect effects upon related systems. We have found that QM Maturity impacts individuals' understanding of QM concepts, leads to increased job enrichment, affects employees' assessments of the organization's culture, as well as their assessments of how the organization is performing (Fok, et al., 2000). We have recently shown that as organizations increase in QM Maturity, their adoption of information systems (IS) will be more user-centered and participative.

Organizational Culture

In this research, we also speculate that *organizational culture* may impact employee perceptions of the green movement and its importance to the organization and to them personally. Moreover, culture may impact perceptions about outcomes as well. Note, however, that the impacts between the culture and the perceptions may move in two directions. Specifically, as organizations become *greener*, we should see a move toward a more empowered, employee-centered, and customer-centered culture. Additionally, however, a culture which is supportive of the green movement should lead to better outcomes

and, perhaps in part through self-selection, to employees who, themselves, are more supportive of the green movement.

A recent in-depth discussion by Zairi (2002) can illustrate what is being considered:

> The concept of sustainable development has been touted as a new planning agenda (Beatley & Manning, 1998). As such, it becomes a fundamental concept that should be an important aspect of all further policy developments (Loffler, 1998). Sustainable development is based on a perceived need to address environmental deterioration and to maintain the vital functions of natural systems for the well being of present and future generations. ***Sustainability*** is defined as 'the ability of an organization to adapt to change in the business environment to capture contemporary best practice methods and to achieve and maintain superior competitive performance' (Zairi & Liburd, 2001). This concept implies that ***sustainability*** is a means for an organization to maintain its competitiveness. Quinn (2000) has a similar idea on ***sustainability***. He describes it as the development that meets present needs without compromising the ability of future generations to meet their own needs. Gladwin et al. (1995), on the other hand, define it as 'development, which meets the needs of the present, without compromising the ability of future organizations to meet their own needs. **Total *Quality Management*** (TQM) represents an integrative approach for the pursuit of customer satisfaction (Chin et al., 2001). However, facing intense pressure of global competition, organizations need to consider incorporating the idea of ***sustainability*** in TQM in order to sustain their competitive advantage and performance improvement. In addition, the interest of organizational survival, growth and prosperity has therefore got to be concerned with not just the present, but also the future.

See also similar ideas by Hitchcock and Willard (2002), Jonker (2000), and McAdam and Leonard (2003).

Linkages to Total Quality Management

Several of the ideas expressed by Zairi (2002) point to the expansion of TQM to include sustainability and note that the expansion is being fueled by pressures to insure long-term survival under increasing emphasis on globalization. See especially Dervitsiotis (2001) and Wilkinson, Hill and Gollan (2001). Finally, and relating closely to our ideas that

employee attitudes toward the green movement may be related to their feelings about TQM programs in the organization, work by Rapp and Eklund (2002) calls for employee involvement with emphasis on suggestion systems. Daily and Huang (2001) point to the importance of human resources management and especially in HR leadership in developing programs such as those fostering commitment (see also Matta, Davis, Mayer & Conlon, 1996). Underscoring the importance of employee personality, Ahmad and Schroeder (2002) have called for selection efforts centering on identifying applicants with potential fit.

This Research

In this research, we extend the examination of these issues to consider organizational culture, employee perceptions of organizational commitment to the green movement and the relationships which may exist between personal and organizational commitment and the QM Maturity of the organization. Additionally, where there is a higher level of perceived commitment to the green movement and where more mature QM systems are in place, we expect that, in the overall, the organization itself will be seen as "doing better" and the impact of the Green Movement will be perceived as favorable. Thus, QM and perceptions of the organization's green movement will be seen as having positive impacts upon organizational outcomes.

Figure 1 shows the linkages we expect and relates linkages to the corresponding research questions. In our study, we believe that the green movement within the organization should be related to or affected by employees' personal green orientation and by the organizational culture (Research Questions 1 and 2 labeled as RQ1 and RQ2 in Figure 1). Additionally, as organizations become more green-oriented, the organization itself will be seen as "doing better" in general and the impact of the green movement will be more positive (Research Questions 3, 4, and 5 labeled as RQ3, RQ4, and RQ5 in Figure 1). Furthermore, organizations with more desirable organizational culture should be more supportive of the green movement (Research Questions 6 labeled as RQ6 in Figure 1). We also expect that

organizational culture is related to employees' personal green orientation and the organization's performance in general (Research Questions 7 and 8 labeled as RQ7 and RQ8 in Figure 1). Finally, we also believe that as more organizations with more desirable organizational culture, where QM systems are in place, and the organization is "doing better," the employees will perceive the impact of the green movement to be even better (Research Questions 9, 10, 11, and 12 labeled as RQ9, RQ10, RQ11, and RQ12 in Figure 1).

Research Question 1: Organizational Green Orientation is related to Organizational Culture.

Research Question 2: Organizational Green Orientation is related to Individual Green Orientation.

Research Question 3: Organizations which are described by employees as higher in Organizational Green Orientation, will also report more positive feelings about the impact of the green movement.

Research Question 4: Organizations which are described by employees as higher in Organizational Green Orientation will also report more positive feelings about the organization's performance.

Research Question 5: Organizations which are described by employees as higher in Organizational Performance, they will also report more positive feelings about the impact of the green movement.

Research Question 6: Organizations which are described by employees as higher in Organizational Culture, they will also report more positive feelings about the impact of the green movement.

Research Question 7: Organizations which are described by employees as higher in Organizational Culture will also report more positive feelings about the organization's performance.

Research Question 8: Organizational Culture is related to Individual Green Orientation.

Research Question 9: Organizations which are described by employees as higher in Organizational Green Orientation will also be described as having higher QM Maturity.

Research Question 10: Organizations which are described by employees as higher in QM Maturity, they will also report more positive feelings about the impact of the green movement.

Research Question 11: Organizations which are described by employees as higher in QM Maturity will also report more positive feelings about the organization's performance.

Research Question 12: Organizations which are described by employees as higher in Organizational Culture will also be described as having higher QM Maturity.

Methodology

Subjects of the Current Study

Subjects in the sample were approximately 323 managers from a wide variety of industries in the South. The subjects were roughly 57.3 % male and 42.7% female with an average age of 41.26. These managers had an average of 20.64 years working experience with 11.11 years in management positions. 35.9% of the subjects are employed in a company which has more than 500 employees, 8.7% of the subjects work in a company which has 251 to 500 employees, 19.5% of the subjects work in a company which has 51 to 250 employees and 35.9% of the subjects work in a company which has less than 50 employees. Subjects responded to a survey asking about their perceptions and experiences about green movement, quality management, and organizational culture in their own firms. In this study, we will concentrate on the relationships among perceptions of support for the green movement by individuals and the organization, organizational culture, QM maturity, organizational performance, and the impact of green movement.

Instrument

Organizational Green Orientation

In this study, we developed nineteen survey questions to measure the Organizational Green Movement. Table 1 provides the items and shows the results of our factor analysis.

Table 1 Factor Analysis on Organizational Green Orientation

Table 1

As Table 1 indicates, we obtained a three-factor solution with 66.644% of the variance explained in the case of the organizational green orientation items. We have labeled Factor 1 as “Green Leadership”, Factor 2 as “Green Products/Services”, and Factor 3 as “Green Workplace.”

Individual Green Orientation

In this study, we developed twenty survey questions to measure the Individual Green Orientation. We obtained a three-factor solution with 51.903% of the variance explained in the case of the individual green orientation items. We have labeled Factor 1 as "Green Actions", Factor 2 as "Green Consciousness" and Factor 3 as "Green Belief." Table 2 provides the items and shows the results of our factor analysis.

Table 2 Factor Analysis on Individual Green Orientation

Organizational Culture

Based on previous research (Fok et al., 2000, 2001), we measured the Organizational Culture by constructing a series of paired opposite items which asked whether the organization's climate should be described as open vs. closed, soft vs. tough, competitive vs. collaborative, and the like. Table 3 below provides the items and shows the results of our factor analysis. We obtained a two-factor solution in the case of the culture items and have labeled Factor 1 as "TQM Culture" and Factor 2 as "People-Friendly Culture." 52.63% of the variance was explained by these two factors.

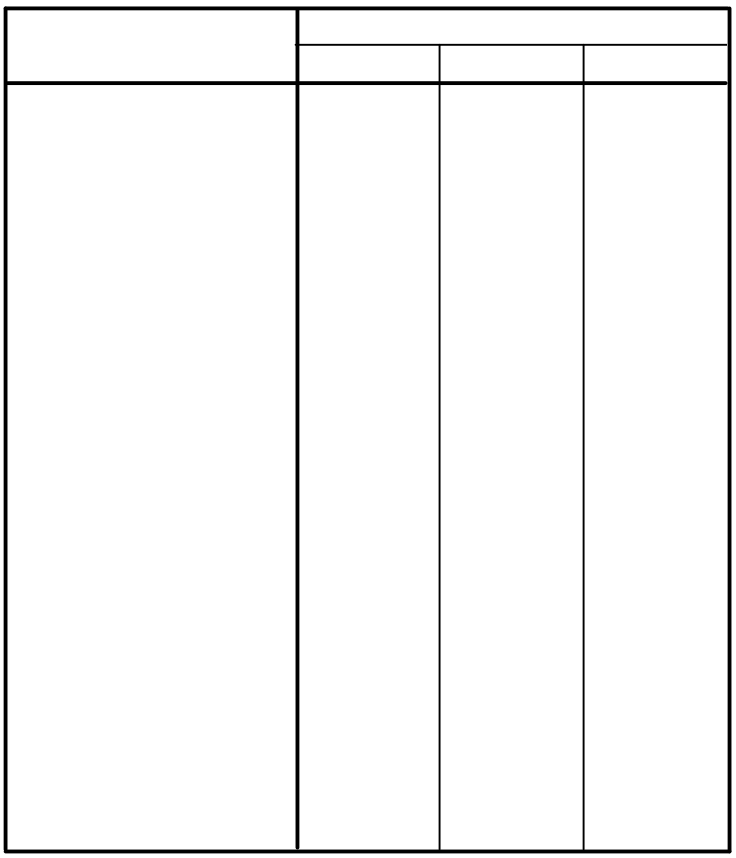


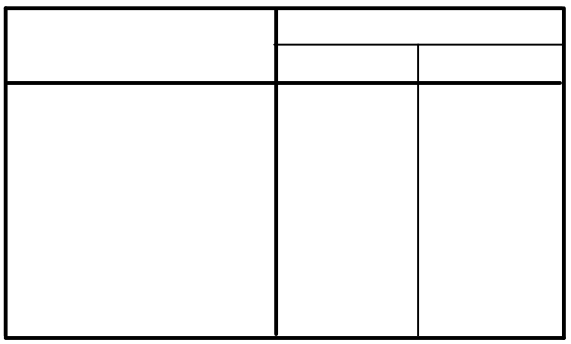
Table 3 Factor Analysis on Organizational Culture

Quality Management (QM) Maturity

In this study, QM Maturity refers, in a qualitative sense, to the *degree* of QM implementation in an organization. We suggest, and previous research has shown (Ahire et al., 1996; Flynn et al., 1994; Fok et al., 2000, 2001; Patti, 2002; Saraph et al., 1989) that it can be measured by examining the perceived use of QM programs. These ideas assume that if an organization has more completely followed the QM philosophy, QM programs should be used throughout the organization and in various functional areas, rather than in isolation. Moreover, if "quality is indeed everyone's job," where QM is more fully in place, employees should be aware of the various QM tools and techniques which are in use. If an organization, on the other hand, has very little or no experience with QM, the opposite is expected to occur. In earlier research (Fok et al., 2000, 2001; Patti, 2002), we began the process of developing a measure of QM Maturity. The instrument we developed dealt with perceived program *use* and asked respondents whether eight programs were in use in the organization, with a range from "not used" to "high usage."

In this study, consistent with our earlier research, the QM Maturity instrument was used to gauge QM Maturity. We conducted a factor analysis to identify the underlying

dimensionality. Two factors emerged from the “Usage” items. The first factor appeared to include all the traditional quality management programs and was termed “Traditional TQM Tools.” The second factor was termed “Advanced TQM Tools” which includes programs like Black Belt training and Six Sigma programs. 62.424% of the variance was explained by these two factors. Table 4 below provides the items and shows the results of our factor analysis.



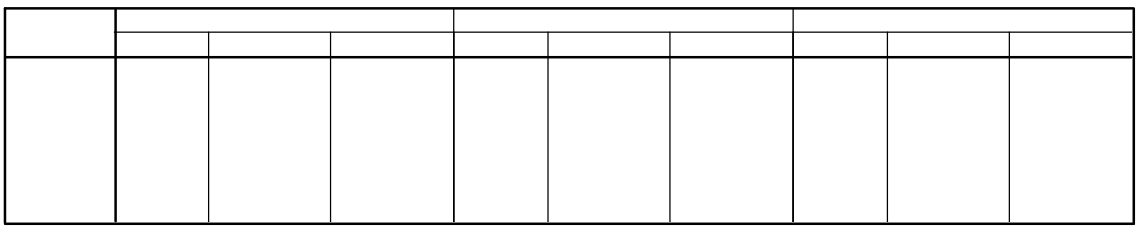


Table 4 Factor Analysis on Quality Programs Usage Items

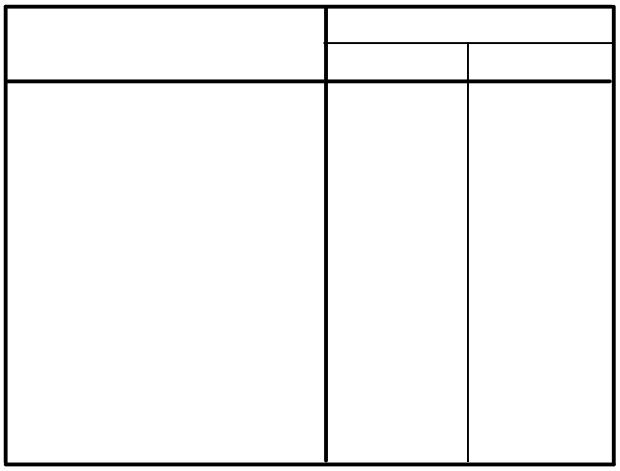
Organizational Performance

The Organizational Performance items were primarily adapted from the Malcolm Baldridge National Quality Award outcome assessment measures. The Baldridge Awards

are designed to identify organizations which are performing in an exceptional manner and include criteria for identifying excellence. We used the Baldridge criteria in the form of a scale which asks respondents to provide their perceptions about their organizations along Baldridge lines. The resulting scale has been used and reported in previous research (Fok, et al., 2000, 2001). The instrument included are items such as "Overall, my company is performing well," "Overall, morale in my company is high," "Overall, I am satisfied with the use of technology in my company," and the like. Factor analysis in this study indicated that one factor was present. We named the factor as "Organizational Performance/Success."

Impact of Green Movement

The instruments included are items such as " Provide better products," "Provide better services," "Have better relationship with customers," "Have better relationship with suppliers," "Have better reputation," "Provide better working environment," "Increase profits," "Reduce costs," and "Improve productivity." Factor analysis produced a two-factor solution and we named them "Strategic Benefits" and "Operational Benefits." 82.184% of the variance was explained by these two factors. Table 5 below provides the items and shows the results of our factor analysis. Additionally, we asked for the respondents' satisfaction with the progress of green movement in their organizations on a 5-point Likert's scale. This question, termed "Satisfied with Green Progress," is included as part of instrument with two other factors, "Strategic Benefits" and "Operational Benefits."



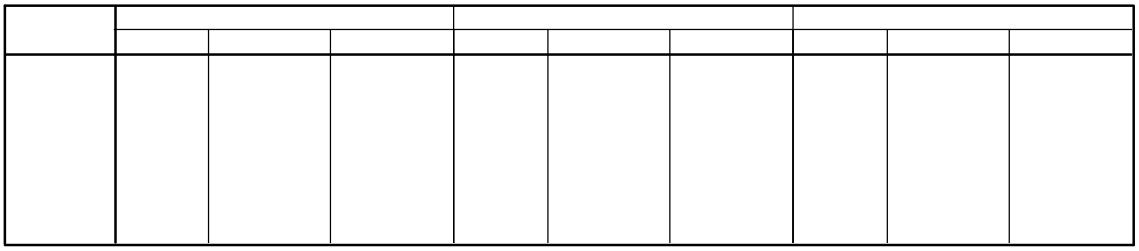
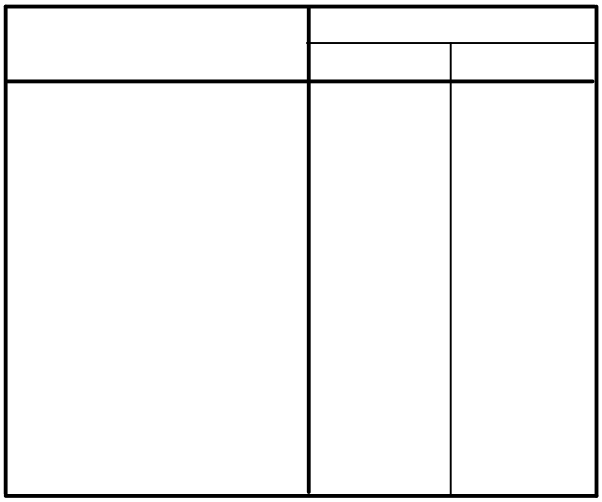


Table 5 Factor Analysis on Impact of Green Movement

Results

Our first research question examines the relationship between Organizational Green Orientation and Organizational Culture. Table 6 provides the results of our correlation analysis. We found only one pair of significant relationship. “TQM Culture” has a significant correlation with “Green Workplace” which implies that as organizations embrace culture that focuses on quality, team, and being proactive, they also are trying to develop a workplace that is environmental friendly to the employees.



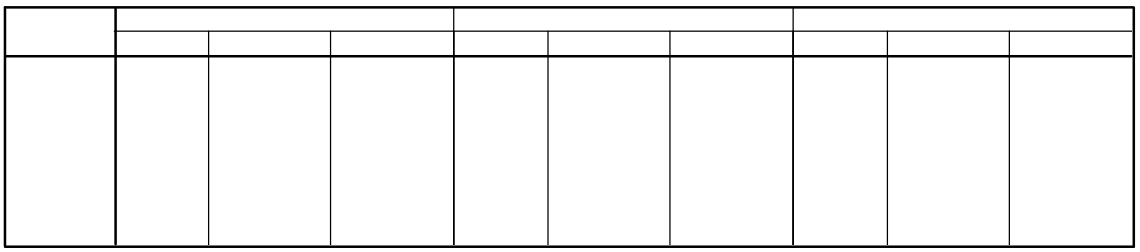


Table 6 Pearson's Correlation Matrix – Organizational Green Orientation and Organizational Culture (RQ1)

Research Question 2 investigates the relationship between Organizational Green Orientation and Individual Green Orientation. We found seven pairs of significant relationships among them. The results are shown in Table 7. "Green Leadership" has significant and positive correlations with "Green Actions", "Green Consciousness", and "Green Belief" at the 0.01 level. "Green Products/Services" has significant and positive relationship with "Green Actions" and "Green Consciousness" at the 0.01 level, and with

"Green Belief" at the 0.05 level. "Green Workplace" has significant and positive correlation with "Green Belief" at the 0.05 level. The relationships are all positive which imply organizations which are described by employees as higher in Organizational Green Orientation will also report more positive feelings about their own Individual Green Orientation. The findings strongly support the proposition that employees' individual green orientations affect the organizations' green movement and vice versa.

Table 7 Pearson's Correlation Matrix – Organizational Green Orientation and Individual Green Orientation (RQ2)

Research Question 3 suggests that organizations with higher level of green orientation would be reported by the employees to have more positive feeling about the impact of the green movement. We found four pairs of significant relationships among them. The results are shown in Table 8. "Green Leadership" has significant and positive correlations with "Strategic Benefits" and "Operational Benefits" implying that green leadership within an organization leads to organizational efficiency *and* effectiveness. "Green Products/Services"

has significant and positive correlation with “Strategic Benefits” and “Satisfied with Green Progress.” The results support the premise that when organizations develop “green” products/services or use “green” material in the production, show more concern with avoiding negative consequences of not being green, and help their employees at all levels to be more green-oriented, the overall impact of these green initiatives is perceived to be more positive by the employees.

Table 8 Pearson’s Correlation Matrix – Organizational Green Orientation, Organizational Performance, and Impact of Green Movement (RQ3, RQ4, and RQ5)

Research Question 4 suggests that organizations with higher level of green orientation would have received more positive feelings about the organization’s performance. The results are shown in Table 8. Only one pair of significant relationship is found. The relationship between “Green Workplace” and “Organizational Performance/Success” is significant at the 0.01 level. The relationship is positive which implies that as the

organizations show more concern in helping their employees at all levels to be more green-oriented, and pay more attention to safety concerns, the organizational performance is perceived by the employees to be higher.

Research Question 5 suggests that organizations with higher level of organizational performance would be reported by the employees to have more positive feeling about the impact of the green movement. We found three pairs of significant relationships in Table 8. Two factors ("Strategic Benefits" and "Operational Benefits") of Impact of Green Movement and "Satisfied with Green Progress" and "Organizational Performance/Success" have significant correlations at the 0.01 level. The relationships are positive and imply that organizations with higher levels of performance would also be reported to have employees with more positive feelings about the impact of the green movement and to have employees who report more overall more satisfaction with the green progress in their organizations.

Our sixth research question examines the relationship between Organizational Culture and Impact of Green Movement. We found three pairs of significant relationships in Table 9. "TQM Culture" has significant correlations with "Strategic Benefits" and "Satisfied with Green Progress" and "People-Friendly Culture" has a significant correlation with "Operational Benefits". The findings indicate that as the organizational cultures are more green-oriented and employee-friendly; the employees see more positive impacts from the green movement and feel overall more satisfied with green progress in their organizations.

Correlations

		Green					Satisfied with

	Green Leadership	Products/ Services	Green Workplace	Organizational Performance	Strategic Benefits	Operational Benefits	Green Progress
Green Leadership	—	—	—	NS	.141*	.194**	NS
Green Products/ Service	—	—	—	NS	.292**	NS	.175**
Green Workplace	—	—	—	.212**	NS	NS	NS
Organizational Performance	NS	NS	.212**	—	.173**	.160**	.460**
Strategic Benefits	.141*	.292**	NS	.173**	—	—	.271**
Operational Benefits	.194**	NS	NS	.160**	—	—	.337**
Satisfied with Green Progress	NS	.175**	NS	.460**	.271**	.337**	—

*. Correlation is significant at the 0.05 level (2-tailed).
**. Correlation is significant at the 0.01 level (2-tailed).
NS = not significant.

Table 9 Pearson's Correlation Matrix – Organizational Culture, Impact of Green Movement, and Organizational Performance (RQ6 and RQ7)

Research Question 7 suggests that organizations with higher levels of organizational culture would have received more positive reports about the organization's performance. The results are shown in Table 9. Only one pair of significant relationship is found. The relationship between "TQM Culture" and "Organizational Performance/Success" is significant at the 0.01 level. The findings suggest that as the organizational cultures are more green-oriented, the organizational performance is perceived by the employees to be higher.

Research Question 8 investigates the relationship between Organizational Culture and Individual Green Orientation. The results are not significant which implies organizational culture does not have significant impact on employees' view of being green at a personal level.

Our ninth research question examines the relationship between Organizational Green

Orientation and QM Maturity. Table 10 provides the results of our correlation analysis. There are four pairs of significant relationships. Two factors ("Green Products/Services" and "Green Workplace") have significant and positive correlations with "Use of Traditional TQM Tools". Two factors ("Green Leadership" and "Green Products/Services") have significant and positive correlations with "Use of Advanced TQM Tools". The results indicate that when employees perceive that their organizations are more inclined to develop green products/services and have a green workplace will be reported as using more traditional TQM tools. The results also indicate that the organizations that are perceived by employees as having higher levels of green leadership and more focus on green products/services will be reported as using more advanced TQM tools. In general, our findings confirm that organizations with higher level of green orientation have used higher levels of usage of both traditional and advanced TQM tools.

Correlations

	TQM Culture	People-Friendly Culture	Organizational Performance	Strategic Benefits	Operational Benefits	Satisfied with Green Progress
TQM Culture	—	—	-.591**	-.205**	NS	-.399**
People-Friendly Culture	—	—	NS	NS	-.132*	NS
Organizational Performance	-.591**	NS	—	.173**	.160**	.460**
Strategic Benefits	-.205**	NS	.173**	—	—	.271**
Operational Benefits	NS	-.132*	.160**	—	—	.337**
Satisfied with Green Progress	-.399**	NS	.460**	.271**	.337**	—

*. Correlation is significant at the 0.05 level (2-tailed).
**. Correlation is significant at the 0.01 level (2-tailed).
NS = not significant.

Table 10 Pearson's Correlation Matrix - Organizational Green Orientation and QM Maturity (RQ9)

Research Question 10 examines the relationship between QM Maturity and Impact of Green Movement. We found five pairs of significant relationships in Table 11. "Use of Traditional TQM Tools" has significant and positive correlations with "Strategic Benefits", "Operational Benefits", and "Satisfied with Green Progress." "Use of Advanced TQM Tools" has significant and positive correlations with "Operational Benefits" and "Satisfied with Green Progress." The results suggest that organizations with higher levels of QM

Maturity would also have employees who report more positive feelings about the impact of the green movement and more satisfied with green progress in their organizations.

Table 11 Pearson's Correlation Matrix - QM Maturity and Impact of Green Movement (RQ10)

Research Question 11 suggests that organizations which are described by employees as higher in QM Maturity will also have employees who report more positive feelings about the organization's performance. We found one pair of significant and positive relationship between "Use of Traditional TQM Tools" and "Organizational Performance/Success". The results as shown in Table 12 indicate that when employees report higher levels of organizational performance, they will also report use of more traditional TQM tools.

Correlations

	Traditional TQM Tools	Advanced TQM Tools	Strategic Benefits	Operational Benefits	Satisfied with Green Progress
Traditional TQM Tools	—	—	.228**	.184**	.237**
Advanced TQM Tools	NS	—	NS	.219**	.172**
Strategic Benefits	.228**	NS	—	—	.271**
Operational Benefits	.184**	.219**	—	—	.337**
Satisfied with Green Progress	.237**	.172**	.271**	.337**	—

*. Correlation is significant at the 0.05 level (2-tailed).
**. Correlation is significant at the 0.01 level (2-tailed).
NS = not significant.

Table 12 Pearson's Correlation Matrix – QM maturity, Organizational Performance, and Organizational Culture (RQ11 and RQ12)

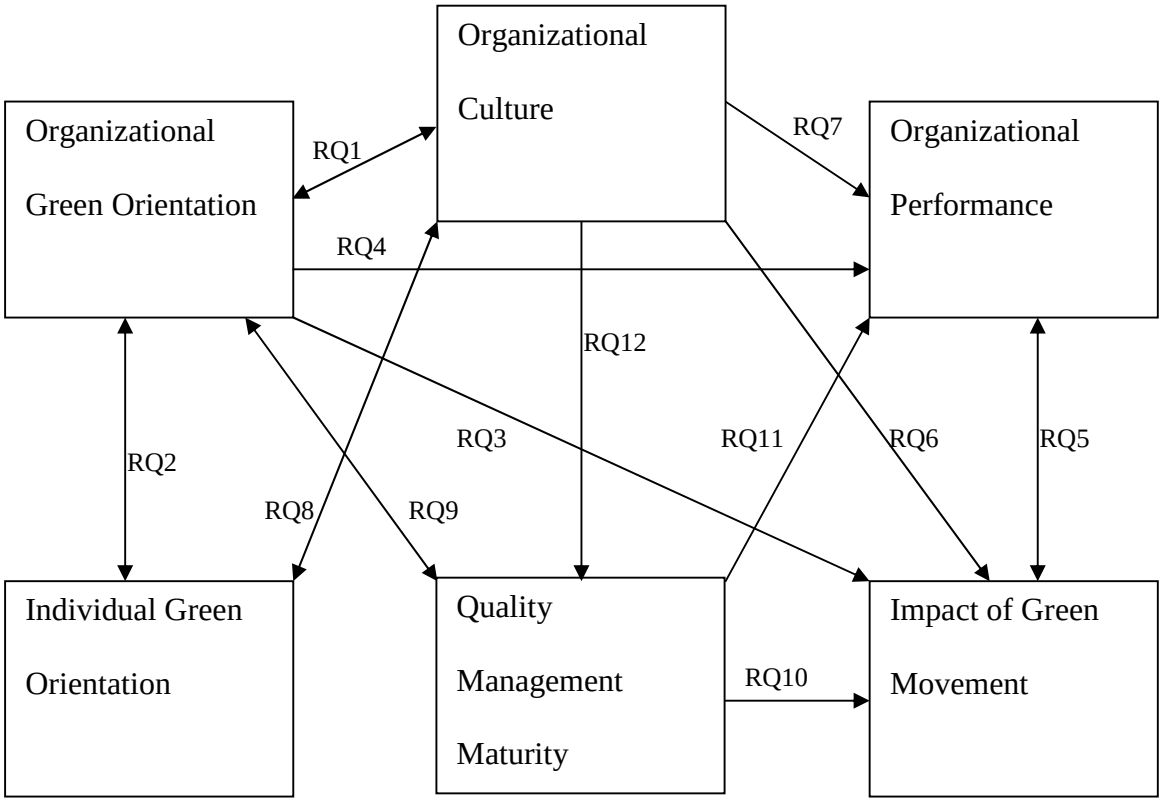
Research Question 12 suggests that organizations with higher level of organizational culture would be reported by employees to have higher level of QM Maturity. We found three pairs of significant relationships in Table 12. The relationship between "TQM Culture" and "Use of Traditional TQM Tools" is significant at the 0.01 level which implies that as organizations embrace culture that focuses on quality, team, and being proactive, they also use more traditional TQM tools. "People-Friendly Culture" has significant relationships with "Use of Traditional TQM Tools" and "Use of Advanced TQM Tools". The findings indicate that, as the organizational cultures are reported to be more employee-friendly, employees will also report that their organizations have higher levels of usage of both traditional and advanced TQM tools. In general, our findings confirm that organizations with higher level of organizational culture have used higher levels of usage of both traditional and advanced TQM tools.

Discussion and Conclusions

In this research, we find considerable support for the linkages among employee perceptions of organizational green orientation and outcomes, in terms of positive impacts of the green movement and organizational performance (see Figure 1). Employees who believe that their organizations are aligned with the green movement are more likely to also see the organization as higher in performance. Moreover, outcomes in terms of overall performance

and positive impact of the green movement will also be higher. Individual Green Orientation did not have a significant relationship with Organizational Culture (see RQ8), but Individual Green Orientation does have seven pairs of significant relationships with Organizational Green Orientation (see RQ2). These findings may have implications for management. This research suggests that when employees believe that their organizations are committed to being green, a number of positive feelings will result. Yet, anecdotally, at least, it appears that many organizations are doing little to keep employees informed of their efforts to support the green movement and its relationship to ideas like sustainability. More and better information appears to have the potential to bring about positive results. Such information, in turn, can be helpful in building an organizational culture which is supportive of the green movement *and* attracting and retaining employees who are personally committed to supporting the movement.

Figure 1 Research Model



Correlations

	TQM Culture	People-Friendly Culture	Traditional TQM Tools	Advanced TQM Tools	Organizational Performance
TQM Culture	—	—	-.332**	NS	-.591**
People-Friendly Culture	—	—	-.134*	-.132*	NS
Traditional TQM Tools	-.332**	-.134*	—	—	.318**
Advanced TQM Tools	NS	-.132*	—	—	NS
Organizational Performance	-.591**	NS	.318**	NS	—

*. Correlation is significant at the 0.05 level (2-tailed).
**. Correlation is significant at the 0.01 level (2-tailed).
NS = not significant.

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