Chaos through the Scorecard

Proposed Conference Paper

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Abstract

In this age of the Information Economy, access to accurate and timely information is necessary to ensure business success. One method of displaying performance measurement information is on a Balanced Scorecard (BSC). The BSC provides a framework for translating strategy into measures that collectively capture the critical requirements for sustaining the organisation's success.

The author has participated in the development and implementation of a number of data warehousing systems, the latest including an automated BSC. The acceptance and subsequent use of the system has been poor and while there may be many reasons this paper looks to Chaordic Systems Thinking to help describe possible reasons.

Keywords

Performance measurement, Balanced Score Card, Chaordic Systems Theory.

INTRODUCTION

Building Performance Measurement Systems with the Balanced Scorecard (BSC) approach (or methodology) is not new (Kaplan & Norton, 1992, 1996a, 1996b, 2000, 2001a, 2001b, 2001c, 2003), although researchers do speculate that the BSC is new to most organisations (Rogers, 1995; Wixom & Watson, 2001).

While this divide is not clearly explained (or understood) it can be agreed that automation of the BSC (Marr & Neely, 2001, 2003; Silk, 1998) is new with about half of large US companies adopting an automated version and many more considering implementation in the near future (Marr & Neely, 2003).

The significance of the research is that large numbers of organisations are implementing automated BSC systems and there is little research on this phenomenon (Marr & Neely, 2003).

This paper, through the use of a case study, looks to Chaordic Systems Thinking and Holonic Management (Frans M. van Eijnatten, 2003) to help describe possible reasons why an organisation may have acceptance problems with an automated BSC.

APPROACH

The research for the paper started with a literature survey. There is a lot of literature regarding the BSC but little on the automation of the BSC.

The study focuses on one data warehousing initiative utilising the SAP Business Information Warehouse (BIW) product and a customised web based BSC. This case study approach allows for assertions to be formulated and results to be generalised (Yin, 1984, 1993, 1994, 2003).

The names of the company and the system have been changed as the Company, although happy to be involved in this research, does not wish to be publicly identified.

Based on a synthesis of the literature and a desktop review of the available company documentation, a model was developed to describe the problem with the automation process of the BSC.

Specifically the research is based on Performance Measurement, automation of the BSC and Chaordic Systems Thinking (with specific emphasis on Holonic Management). These areas are described further below with respect to current literature.

PERFORMANCE MEASUREMENT

Performance Measures are important to the effective running of an organisation; however there is little research on what makes an effective performance measurement system.

Performance Measurement according to Neely (2002) is concerned with:

- Measuring the efficiency and effectiveness of actions;
- Aggregating and standardising information;
- Setting appropriate targets

A Performance Measurement System according to Kueng, Meier and Wettstein (2001) should perform the following functions:

- Tracks the performance of an organisation,
- Supports company internal and external communication regarding performance,
- Helps managers by supporting both tactical and strategic decision-making,
- Captures knowledge in a company, and facilitates organisational learning.

The ongoing definitions between efficiency, effectiveness, data, information and knowledge are not discussed in this paper, as it is not deemed relevant. What needs to be stated is that senior managers make decisions based on performance measures that affect the viability and ongoing performance (competency, competitive position and continued profitability) of their companies (Ahmed, 2002; Eccles, 1991; Kaplan & Norton, 1992; Neely, 1998; Neely, 2000; Neely, 2002).

Historically, performance measurement systems were one dimensional and focused purely on financial measures (Bourne, Franco, & Wilkes, 2003) before Eccles (1991) Performance Management Manifesto and the Kaplan and Norton's (1992) Balanced Score Card (BSC). Other types of Performance Measurement Systems include the Business Excellence Model, Shareholder Value Frameworks, Activity Based Costing, Cost of Quality and Benchmarking (Neely & Adams, 2001).

What is agreed in the literature is that the BSC has evolved to incorporate the concept of "business models" (Eccles and Pybum, 1992) and "strategy maps" (Kaplan & Norton, 2000). The BSC has emerged as the cornerstone of a Total Business Performance Management framework.

AUTOMATED BALANCED SCORE CARD

The Balanced Scorecard book by Kaplan and Norton (1996a) is one of the best selling business books ever. Its ideas have been adopted by most of Forbes Global 2000 companies (Arveson, 1998) and are widely accepted by government (The Executive Office of the President, 1993). Research into the BSC approach to management has been researched in about 50 companies and government agencies so far (Arveson, 1998). The BSC not only records results but is used to indicate expected results (budgets and targets) (Walters & Buchanan, 2001).

The BSC makes an organisation's activities visible as it adds the visibility by utilising a top down management approach that allows managers to determine progress against publish agreed strategies and to identify trends.

In 1998, the Gartner Group predicted that by 2002, 40% of Fortune 1000 organisations would have some form of strategic measurement system like the BSC in place (Niven, 2000), while Arveson (1998) suggests that BSC ideas have been adopted by most of Forbes Global 2000 companies.

Enterprise wide performance systems, based on the BSC, were predicted to occur in 2000 (Cameron, 2002; Dikolli, 1999; Frigo, 2000; Sullivan, 2001) although the claim was subtly modified to "many companies will be deploying such systems enterprise-wide" (Dresner, 2001; Sanger, 1998). The differentiation is important because before 2000 most organisations used spreadsheets to create a BSC (Krause, 2003; Linard & Dvorsky, 2001; Neely, 2004; Sanger, 1998).

Producing one set of numbers and publishing them in an enterprise way is very difficult if collated through a spreadsheet. Marr & Neely (2001; 2003) detail a number of disadvantages to using spreadsheets. These are:

- Scalability – BSC's spreadsheets quickly reach the capacity.
- Error prone and time consuming. As spreadsheets are mostly updated manually, it can be assumed they can have incorrect data entered and this takes time. Depending on the calculations of the measure many different inputs may be required to provide a performance measure for the company.
- Analysis or fault tracking – because data is stored in individual spreadsheets, it is very difficult and time consuming to analyse and trace faults.
- No collaboration and increased communication coordination. As data is stored in multiple spreadsheets, they are often stored on different machines and may require access by different people. Only one person can work on a spreadsheet at a time. It requires discipline to work on the same spreadsheet to ensure that data remains error free.

So what happened in and around the Year 2000 to allow the implementation (and automation) of the BSC? With the pending millennium (and associated bug), many medium to large-scale organisations choose to replace their systems with enterprise resource Planning (ERP) packages. These systems were sold on integration, best practice through a standard process and better access to process statistics.

In the Burton-Jones (1999) book "Knowledge Capitalism: Business, Work, and Learning in the New Economy", Alan Burton-Jones discusses the implementation of complex applications like SAP's ERP application R3 and states that the success of R3 is based on standardisation. He proposes that SAP customers believe the value of a "standard" exceeds the value of their own specific organisation experience and corporate knowledge. SAP itself identified the need to access the information in the R3 ERP system by producing a suite of software products based on its own data warehouse to allow access to this information in a standard format. These SAP products are based on a data warehouse (BIW) with a mixture of business intelligence applications.

A centralised data warehouse summarises key information from decentralised databases. (Inmon, 2003). Data warehousing has received a lot of attention from practitioners and researchers and although data warehousing has been around for the last 10 – 15 years success and failure stories are rare. This may because the data warehouses are implemented to solve a business specific problem (e.g. Sales Targeting) and have been specifically focused on one or a few business problems. General user use of a data warehouse is rare.

Once configured, the SAP BIW applications provide many capabilities including an automated BSC. By utilising SAP's Standard business content the claim is that business' can have an automated interactive BSC up and running within 1 – 2 months. SAP claim in excess of 7,500 installations of their BIW product (Pogson, 2004).

The aim of these BIW systems is to automate the performance measuring and management reporting initiatives and to share data within that organisation (Marr & Neely, 2003). Apart from vendor sponsored publications there are few reports on warehousing from a research perspective.

Marr and Neely (2003) produced a set of criteria for he selection of the various software offerings currently marketed to automate the BSC. They have reviewed the literature on BSC automation and believe the major reasons for an automated BSC application are:

- Data integration: BSC software allows data from various sources to be joined together to produce a picture unavailable from any one system.
- Data analysis and storing: As BSC applications are mostly based on some form of data warehouse, drill down and slice and dice analytical capabilities are also possible.
- Communication and collaboration: BSC application software are now typically web based and can be shared within and outside an organisation. This allows organisations to share and comment on results as they become available. This enables collaboration and feedback loops (Silk, 1998)

CHAORDIC SYSTEMS THINKING

Frans van Eijnatten (2003) use of Chaordic Systems Thinking (CST) to explain human performance management has many similarities to performance measurement in the case study. But what is Chaordic Systems Thinking? What is Chaos or is that chaos?

chaos (lower case) is commonly known as a condition of disarray, discord, confusion, upheaval and bedlam due to an absence of order. This complete absence of order is both a logical and a factual impossibility. This is demonstrated by Chaos (and chaos theory). Chaos (uppercase) is a term covering the research process about the nature of the universe and is all encompassing (Fitzgerald & Eijnatten, 2002). Chaos is a process whereas chaos is not something one plans, it that just happens. When investigating chaos, different points of view, or lenses as they are called, are used in the Chaos process.

A chaord (or chaordic as it more commonly referred to as) is an amalgamation of the terms chaos and order. The joining signifies the fact that the two seemingly opposites are really linked to one another as one cannot exist without the other being present (Fitzgerald & Eijnatten, 2002). It is anything that is simultaneously orderly and chaotic, neither dominated by order nor chaos or exists in the phase between order and chaos (Frans M. van Eijnatten & Wäfler, 2002).

CST is a context for thinking, seeing and interpreting organisational activities (or patterns) whilst working in a chaotic environment (the world of chaos) (Frans M. van Eijnatten, 2003). This world can be either simple or complex. CST provides an approach for analysing and designing a complex, dynamic, multi-faceted, team based, unstable system that recognises the unstableness of an organisation. The perspective of chaordic systems thinkers is informed by the fundamental principles of Consciousness, Connectivity, Indeterminacy, Emergence and Dissipation (Fitzgerald & Eijnatten, 2002). Another feature of CST is the concept of ‘holons’. Holons are entities that are both wholes and parts of a greater whole, at the same time (Koestler, 1967, 1978).

Holons become apparent, that is they evolve or dissolve into higher orders of whole or the part by virtue of four fundamental capacities possessed by each part. These are Identity; Membership; To go beyond what went before; and Decomposition (Frans M. van Eijnatten, 2003). They are simultaneously autonomous but yet dependent. These leads to holonic capacity which is the degree or measure of “wholeness” (Fitzgerald & Eijnatten, 2002).

Holon is a term created by Arthur Koestler (1967) to acknowledge the fact that every entity in existence is a whole in its own right as well as a part of some greater whole - simultaneously. Every ‘thing’ is a holon including the chaordic system we know as an organisation, company or self. Every holon, is capable of rising to a higher level of significance. This is why one performance measure is important to the person measuring/managing it, but the measure may not be important in the corporate organisational scorecard (or may even be a subset of the scorecard). This of course is time dependant as something important today is not necessary important tomorrow but maybe in the future.

The higher a chaordic system an organisation develops the greater its ability to self-organise, self reference and self-iterate in increasingly complex forms (Fitzgerald & Eijnatten, 2002). This is done via the twin processes of differentiation (becoming more diverse in its parts) and integration (synthesis of the parts into greater wholeness).

Chaordic Systems Thinking (CST) is a framework that uses chaos as a lens and as an allegory for change (Frans M van Eijnatten & Wäfler, 2003). Chaos in this paper is used to describe the fact that systems develop and live in a complex environment. It is not Chaos as defined in mathematical theory (Stewart, 1990).

CST offers new concepts in order to deal with uncontrollability, uncertainty and complexity in an enterprise, in a better way.(Frans M van Eijnatten & Wäfler, 2003)

CASE STUDY

A large global company (the Company) embarked on a project to produce performance measures automatically. They started their journey a few years prior to the year 2000 as they wished to manage their business using the principles of the BSC. Their goal was to have online access to performance management information through an automated BSC (Kueng et al., 2001). This automated BSC was to be based on a data warehouse and available via the companies' global intranet.

History

As the Company's Performance Management System evolved, so was Kaplan and Norton's (1996) Balanced Scoreboard evolving. The similarities to the evolution events are illustrated in Figure 1 below as a set of Converging Timelines (Kaplan & Norton, 1996a, 2001b, 2001c; Lucier, Schuyt, & Spiegel, 2002; Malone, 1997; Sveiby, 1997). Clearly the beginning of the 1990's was a time for reflection as the business strived to improve.

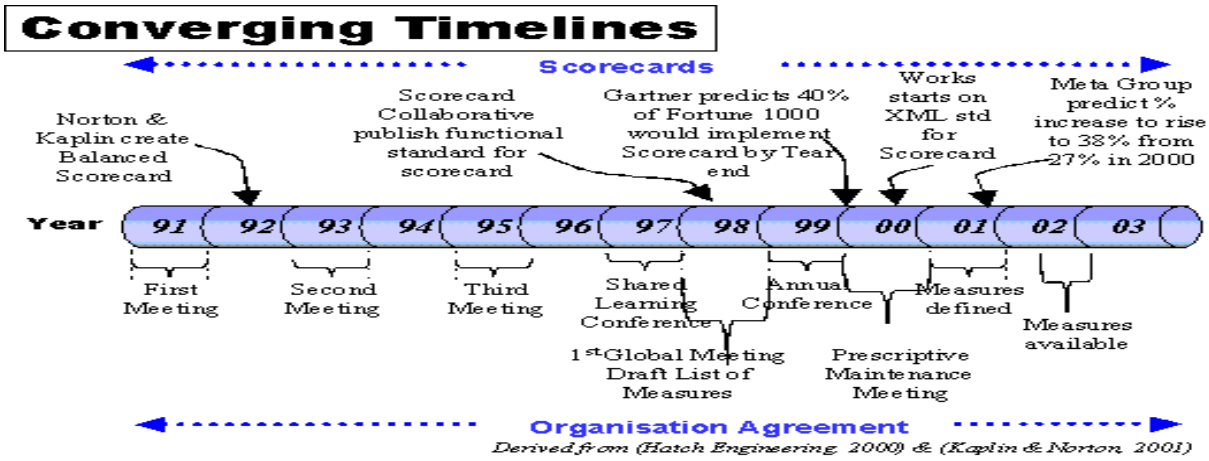

Figure 1: History of the Company decision points for performance measures compared with the BSC Evolution

The Company understood the importance of in process metrics as this had been demonstrated by the Total Quality Management (TQM) movement where TQM practitioners had demonstrated that superior quality can be achieved without the need for extensive inspection checks, by keeping processes - in control (Gyani, 1995).

The company classified itself as being data rich and information poor (KPMG, 2000). It was identified that the company could improve the overall effectiveness of business information by lifting the quality of information provided to managers and reducing the quantity of data.

The Company now works to an agreed set of key performance measures that are formally reviewed each year. The measures are business driven and as such the mechanism for how the information would be obtained, deployed or shared are not considered. Mechanisms used include spreadsheets, user created Microsoft Access databases and extracts from source systems, including SAP.

Web-base access is primarily designed for people in remote locations around the world to allow better access to information and to allow communication of "best practice".

The Project

The project to automate the BSC originally started in 2000 and after a number of failed attempts, the project was cancelled. Eighteen months ago the project was restarted. These events are

important as it indicates the business understood the importance and was committed to automating the performance management and reporting process. The key motivator was the CEO who reported that he was concerned at receiving conflicting numbers from different parts of the business. The most senior manager in the Company authorised the restart of the project.

The Company's CEO expected the automated BSC to allow users of the system to:

- Manage by Exception – enabling a focus on what's important and requires some focus in the vast amounts of available information;
- Drill-down from results in the BSC into additional details where required;
- Analyse trends and carry out cross-functional analysis using credible data;
- Reduced cost of data collection / input; and
- Assist the Company, particularly the Globally operational personal, to provide actionable information that helps the business to collectively achieve business success.

The system was divided into 4 phases with Phase 1 and Phase 2 going live in May 2002 and August 2003 respectively. Phase 3 is due in April 2004 with the project completed through the delivery of Phase 4 in July 2004. Phase 1 & 2 automated the BSC for 2 of the 3 divisions and provided an automated management and reporting system.

Technology

The Company undertook the project to collate all of the operational data into one central source. The Data Warehouse solution provides for:

- Timely, actionable information;
- Information at the right level of detail;
- Current and historical information;
- A cohesive view of the total business; and
- A single source of data.

SAPs' BIW was chosen as the technology platform as it had automated links to the existing ERP system and had the capability of a Web enabled BSC.

The technical benefits of the solution were considered to be:

- Integrated disparate data;
- Ability to load spreadsheet data;
- Simple to use Web Interface;
- Excel based Analytical tool;
- Ability for authorised users to modify/create queries and save them in their favourites;
- Was based on same ERP technology platform;
- Allowed comments to be made (and shared);
- Had a simple security;
- Ability to review KPI's prior to publishing; and
- Allowed drill down into detail

The automated BSC presents two levels of Company scorecards based on agreed key performance indicators (KPI's) that are updated daily and visible to managers across the organisation. It is designed so executives and managers can easily see the status of their KPI's and to drill down and investigate root causes where targets are not being met. (Figure 2 and Figure 3 below). It should be also noted that some figures are only relevant at specific periods: weekly, monthly, yearly e.g. Financials are only relevant after end of month financial processing.

Figure 2. Typical Web Based BSC

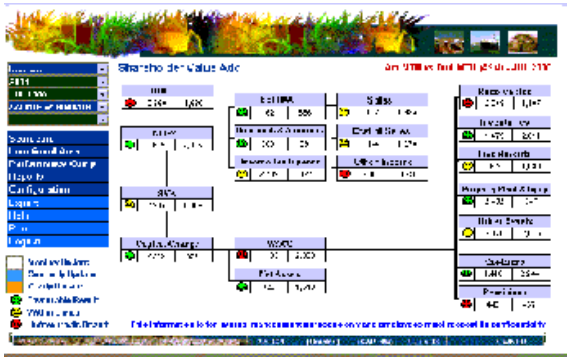

Figure 3. Typical Drilldown (Dupont Chart)

At a management level, the system provides consistent, standard operational reports across the Company, with the ability for managers to create their own reports if necessary. The system is intended to make it easier to share information across the various business units, and up and down the line.

Problems Encountered

The system is used by only a small number of people (50 out of 500 trained with an average of 5 a day) and 4 of 10 different subject areas within the warehouse are still to be formally accepted.

An internal Company sponsored review was conducted, where a random sample of 10% of users logons were selected to ensure that respondents represented a spread of sites, departments and management levels, to try and identify the problems and issues. Project Team members and support staff were excluded from the selection process. Survey participants were contacted either by telephone or in personal interviews and asked to respond to the prepared question set. The review produced a report that detailed problems and recommended subsequent.

In summary the reports mains points are:

- Benefits foreseen at a corporate level are also applicable at a departmental level. People did not know how to identify with how they will be impacted by the change and a formal Change Management Plan was required.
- Business people were unaware of the project and it's significance. Critical Project Milestone dates were not known. A Communications Plan, specifically the adoption of a consistent, targeted communications approach that detailed key project milestones and business objectives was required;
- There was a lack of confidence in the overall business community that the data was correct. There was a need for identification and publication of Quick Wins in individual business units that generate momentum in other areas and build confidence in the warehouse system;
- The business was too busy and didn't have the time to spend verifying, validating and learning a new tool. The Project Team were advised not to let up, by having a consistent focus on all stakeholder groups, supported by internal structures and support processes that drive the department in its pursuit of business benefits; and
- A need to make changes stick by gathering and monitoring intelligence on usage behaviours and decision-making competencies that ensure the OIC is a tool that is critical to business success.

A review done of the technical project team indicated they were concerned at the time taken to perform user acceptance testing. In the main most of the issues deal with the ability of the business to verify and validate that the results being produced were correct. In some cases the user acceptance testing (UAT) process took over 6 months due to the business not having time to spare and the level of complexity required to verify and validate the results. The delay was mainly caused by the fact that business users had to be convinced to trust the system was calculating the results correctly.

Formal testing results identified that the apart from small discrepancies, the warehouse was correct and that the business had been misreporting performance measures.

Chaordic System Theory and the BSC

Manual BSC Process

The process, prior to the automated BSC, was a manual one with data being manually collated or extracted via reports from local systems and put into either spreadsheets or word processing documents.

These spreadsheet/word processing reports were then forwarded from the Branch to the Department and collated and reformatted. The Department results were then sent on to the head office where they were collated and reformatted again into the company results. At all levels the results were believed to be correct although when questioned the results would sometimes change. Changes were also made to previously reported measures (history).

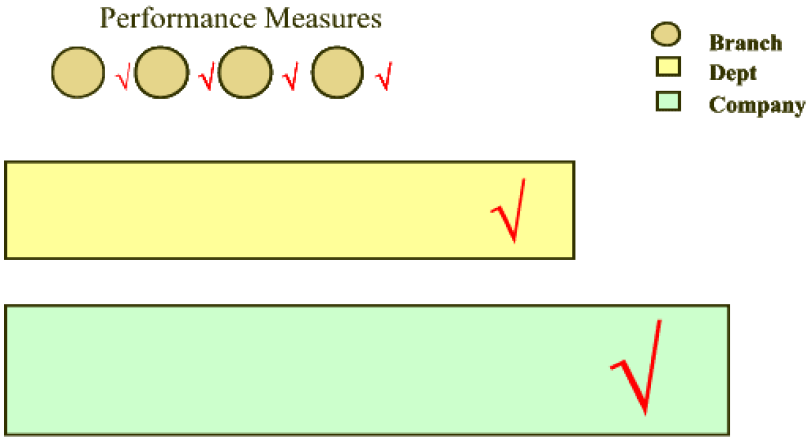

Figure 4. Manually collated Performance Measures were prepared and were certified correct by each level of reporting. If not correct they were changed.

When conflicting results at the company level were detected discussion usually centred around which department or branch figures were correct and were changed accordingly. The changes were not always made to the original source. As far as each branch and department was concerned their numbers were always correct. This is illustrated in Figure 4, above.

Relating this to CST, each branch or department managed and reported their own performance measures mostly via spreadsheets. These branches and departments can be considered as holons as they work autonomously but are still part of the wider organisation. This is illustrated in Figure 5, below. The whole and the parts are dependent yet autonomous. Against budgets and targets set, each holon excelled and the company remains extremely successful.

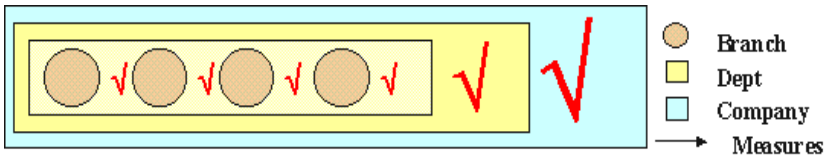

Figure 5. Manually collated Performance Measures were correct at each level of reporting and the company excelled.

The extensive use of spreadsheets correlates to the literature where the spreadsheet process was one that is commonly referred to for creating BSC (Krause, 2003; Linard & Dvorsky, 2001; Neely, 2004; Sanger, 1998).

Automated BSC Process

The new automated BSC process for the Company is based on daily extracts from a number of corporate systems that feed the data warehouse, daily. Data is based on Functional areas that include: Finance, Human Resource, Plant Maintenance, Supply, Logistics, Health and Safety, Production (three tiers: primary, secondary and tertiary) and sales. Production and Health and Safety data is sourced from a mixture number of custom built and package software. Most other data is sourced from SAP.

As the BSC is a top down performance management system, the automated BSC reported data at the department and company level only. This data in the main disagreed with that being previously reported through the manual process. Budget and target information in most places did not exist in the automated BSC.

An important part of the BSC is comparing actuals against budgets and forecasts and tracking the results. In the Company's new automated BSC, budgetary and forecast data was only available from a small percentage of the source systems (this included SAP R3). While most of the Production systems did not cater for budgets or forecasts in their design, the SAP R3 system only had budgets and forecasts loaded at a departmental level and above. Budget and Forecast data either didn't exist at branch level and the only source was a spreadsheet.

During UAT, missing and incorrect data proved to be major problem as even though test data reported correctly the user experts doing the testing could not verify the results quickly and when they went down to detail the data at a more micro level (i.e. branch) not all of the data existed in the warehouse. This is illustrated in Figure 6, below.

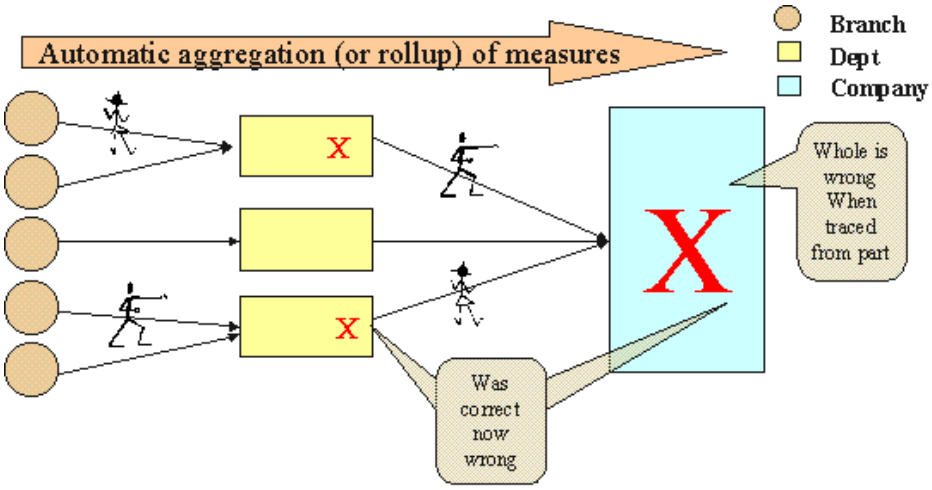

Figure 6. Performance Measurement Process failed when people were taken out of the process.

As the UAT progressed it was discovered that there were process problems in the entering of data at the source. Previous performance measures were incorrect and people in the manual process modified/corrected data as they were aware of the errors in the process. People in the company stated they new the performance measure was incorrect but it was near enough for operating purposes but when used for management reporting this number was typically corrected.

Another issue identified was performance measures appeared to be incorrect when comparing them to source systems. This problem was identified as a timing problem as each measure has a scope of relevance with respect to time. The BSC typically is reported at the end of the month. This aligns all measures to the same timeframe. But operational measures are required daily, to ensure production targets are met, to ensure ingredients are not under/overused whilst ensuring quality and safety is maintained. The order instilled by the BSC cannot be enforced daily on an organisation it must be coached. The automation of the BSC process identified problems in source system data entry and management.

To make this point clearer, if one looks at costs and how they are used in the cost per unit calculation for production the only time all costs can be dispersed is at the end of the month. If costs per unit was calculated daily and lets say a bundle of invoices were not processed the unit cost per unit would go down. If one looks at the opposite view and all invoices were paid on the first day of the month the cost of production per unit would skyrocket. It is only when the order of allocating all costs to all production over the month does the measure become meaningful. As stated earlier, managers do not go out of their way to enforce chaos (lower case) on their organisations but using an automated BSC without intrinsic knowledge of the timeframe and data sources can create chaos.

The reason for this near real time requirement may not be able to be arguable as research indicates that managers do not always base their decisions on numbers but sometimes the decision is based on some gut feel or management perception (Starbuck & Mezias, 1996) and the hence having up to date data does not have any influence on the decision.

Conclusion

Each Performance Measure in the Case Study company could be considered a Holon. Each measure is unique as the measures are both wholes and parts of a greater whole in the Performance Measurement System. Each measure is simultaneously autonomous but yet dependent.

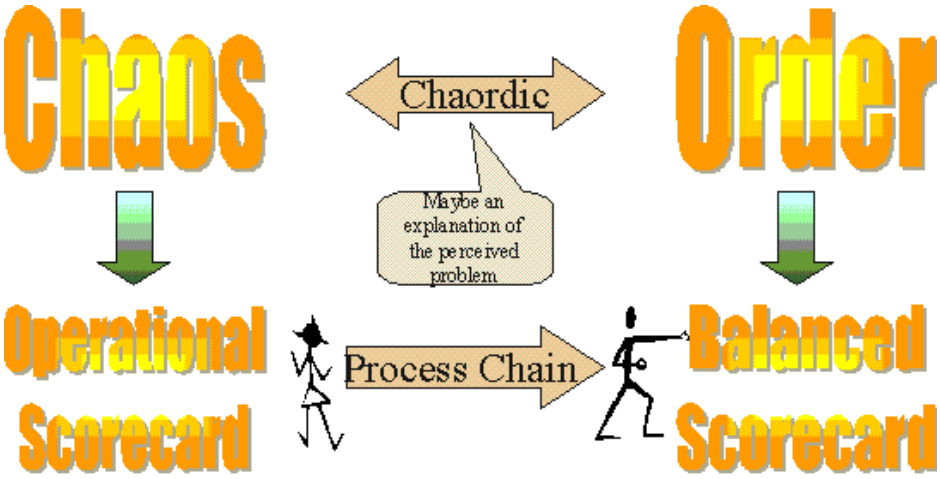

Figure 7. Relationship between Chaos and Order with respect to the BSC.

Figure 7, above illustrates the relationship between Chaos and Order with respect to the BSC. Operationally, events occur that impact directly on performance measures that are specific to the day to day running of a business whereas these measures are aggregated into the monthly reporting through systems like the BSC. This monthly reporting therefore provides some sense of order. The measurement process can therefore be deemed Chaordic.

Although CST has been used mainly as a method for organisational renewal and change (Backström & Eijnatten, 2003; Frans M. van Eijnatten, Dijkstra, & Galen, 2001) and job redesign (The SALTSA/SWS Research Group, 2000). Other elements of CST maybe able to be used in the Performance Measurement Process either during the definition phase or when they are being reviewed.

The similarities outlined in this paper between CST and Performance Measures illustrate that it is possible that other aspects of CST may assist the automation of Performance Management Systems like the BSC as large numbers of organisations are implementing BIW systems and are struggling to understand why they are not being accepted. There is little research on this phenomenon and even less on what needs to be done to ensure their success (Marr & Neely, 2003). Further research in this area is encouraged.

Performance Management applications is another area for further research as there is little research on Performance Measure Software Applications and their implementations (Marr & Neely, 2003) . This includes bespoke, COT or highly customised COT applications. The benefits of such research will benefit many users who have or are planning to implement performance management software.

There are limitations to this research due to:

- The methods used and the use of only one case study;
- Limited literature as most research is around the BSC and not the results of automating it;
- Personal bias due to direct involvement in the technical development of the data warehouse applications in the case study; and
- No interviews were conducted, due to time constraints, which means the conclusions cannot be confirmed.

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