Foundations for a Team Oriented Curriculum

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ABSTRACT

The business world today values collaboration and team work skills such as those found in the area of project management, business process reengineering, quality circles, etc. In response, the use of group projects permeates many curricula today with varying consequences and levels of success. Technology claims to enhance collaboration in distributed teams but its success has been a challenge for organizations. Our objective, is to demonstrate that the concepts underlying team work can be the pedagogical basis for a hands-on, information systems class to teach the development of systems to support teamwork. In the end, the class exposes students to the underlying assumptions of good group work and provides underlying principles for how best to automate a collaborative environment.

INTRODUCTION

The case can be made that while individuals are still important, groups are becoming the de-facto unit of work for organizations today. Working cooperatively is becoming a necessity; while working collaboratively is becoming critical to success.

Over the years, the popular press (Information Week, 1999; Business Week, 1999; Computerworld, 1999; USA Today (Kay 2011); CIO Magazine (Schiff, 2013); Forbes (Adams 2014); and Monster.com (Lester, 2016), identified and continue to identify the fact that organizations today emphasize more and more group work and that teamwork skills are more and more important in recruiting. Pundits estimate that managers spend as much as 80% of their work time in meetings and working with groups (Johansen, 1998). More detailed studies by Robert Johansen (1998) add additional confirming details. Johansen's list of driving forces contributing to the trend toward the increased use of business teams includes; a decreasing number of middle managers, a trend toward contract work, an increasing geographic spread for companies and more team-oriented companies becoming the model.

This last force is further confirmed in Peters and Waterman's book, In Search of Excellence (1982, p.127), where they record that the small group is becoming the main building block in those businesses with a "bias for action." Kilmann (1985 p.43) presents the team in the most positive light when he writes, "Generally, it is the team approach that will provide the most comprehensive source of expertise and information to solve complex problem, where synergy enables the team to contribute more than the sum of its members." College recruiters and employers explicitly support this notion as they consistently rate teamwork skills and group skills high in their evaluation of future employees. Martz and Landof (2000).

GROUP AND TEAMWORK SKILLS ARE EMPLOYABLE SKILLS

Mattson (2015) proposes 6 key benefits of teamwork in the workplace: Fosters creativity & Learning; Blends Complementary strengths; Builds trust; Teaches conflict resolution skills; promotes wider sense of ownership; Encourages healthy risk-taking. Teamwork skills are sought after and employable skills. University of Kent (2016) surveyed their graduates who worked for employers such as Microsoft, Target Jobs, and the BBC. The survey results list teamwork as the number 2 skill that employers want. In a second broad based survey, National Association of Colleges and Employers (NACE) reports that "[the] ability to work in a team structure" as the number one skill employers seek (Adams, 2014). *US News* (Holmes, 2014) echoes this finding and places collaboration at the top of their list saying, "It is imperative for college-bound students to function efficiently and appropriately in groups, collaborate on projects and accept constructive criticism when working with others." Finally, the job-search site, Monster.com, identifies teamwork as an essential job skill after review hundreds of thousands of job descriptions (Lester, 2016).

The need to incorporate this desire from employers for employees with well-rounded, broad-based technical skills complemented with soft skills is not new (Bailey and Mitchell, 2007; Kung et al, 2006; Martz and Cata, 2008). Barr and Tagg (1995) identified a gap between academia's "espoused theory" and academia's "theory in use." Essentially, when evaluated, the idea of teaching more real-world business concepts, the espoused theory, was not being achieved, the theory in use, by business schools.

These newer, additional program requirements center on activities such as teamwork and integrate knowledge across several functional areas (Trauth et al, 1993). In a study similar to Barr and Tagg (1995), Martz and Landof (2000) found that recruiters ranked team skills in the top three "most desirable" skills for graduates. More significantly, the recruiters surveyed placed team skills among the skills needed for career advancement. Trade publications, *ComputerWorld* (Ouellette, 1998), and academic research (Bailey and Mitchell, 2007; Martz and Cata, 2008) continuously confirm that these concerns for business school educations linger. The business information systems field is one academic discipline that has attempted to respond by incorporated more emphasis on where this skills are distinctive competencies for career placement and advancement. These areas include project management, requirement definition, quality circles, etc. As these areas are incorporated, more attention must be paid to understanding how groups work.

HOW GROUPS WORK

The fundamental task for most problem-solving groups is to resolve an issue. These can be either a problem or an opportunity. As the team works toward resolving its assigned issue though, characteristics of the group members combine with those of the task in what is almost an infinite number of ways. Combinations which move groups toward "better" decisions are termed process gains. Those combinations which move the group away from a "better" decision are termed process losses. Shaw (1981) identifies the major areas of process losses and process gains along with significant group research in those areas.

Process losses are found with traditional groups, so we should openly expect to find new process losses identified with electronic groups. As ongoing iterations of research in this area occur that compare manual to electronic environments (Dennis and Kinney, 1998) , new environments are created. One such environment is the group support systems environment defined as an "interactive, computer-based environment that support[s] concerted and coordinated team effort toward completion of joint tasks" (Polya, 1957). Martz (1999) proposed that as GSSs are implemented, researched and used, the new environment may create their own set of group process losses. For example, two such losses – information overload, higher levels of non-consensus – have been identified in the research.

Most researchers, practitioners and theorists describe the task of group problem solving as having a divergent phase, called production, and a convergent phase, termed selection (Table 1). Interestingly, these sub-processes so necessary in problem solving, seem to antagonize each other when a group is trying to reach common ground or consensus.

Historically, groups accomplish the divergent process more easily than the convergent process. Research shows that electronic GSSs have been able to outperform traditional methods for producing numbers of comments and numbers of unique comments (Shepherd et al, 1996; Gallupe et al., 1992; Dennis and Valacich, 1993; Benbasat and Lim, 1993; Valacich et al., 1994). However, along with this increased production comes the associated dysfunction of groups inefficiently combining and filtering the large lists of comments, ideas or items. There are so many items that individuals have difficulty assimilating all the information.

This clearly presents a dilemma for problem solving groups. Maximizing the divergent process should provide

Table 1
GSS Process Gains and Losses

Derivative Process Losses	Primary Process Gains
• channel conflict	• better analytical support
• information overload	• easier multi-phase voting
• overhead costs	• more reflective
• GSS influence choosing wrong "structure"	• increase in "effective" group size
• stronger identification of non-consensus	• wider perspective of information domain
	• removal of time and geographical constraints

the better opportunity to maximize creativity and idea production; however, maximizing the divergent process may make it harder to achieve consensus. So, the tradeoff for groups may be production versus consensus; more production lowers consensus.

Therefore the group processes, techniques or methodologies applied in meetings attempt to resolve an issue by facilitating the identification of possibilities (diverge) and place them in categories (converge). Some methodologies, like Buzan's mind mapping (1991), tend to make the categories up on the fly while others such as de Bono's 6 hats have predetermined categories. The table below list a representative set of problems solving techniques, methodologies, and tools that work both at the individual and the group level.

Table 2
Problem Solving & Creativity Techniques

6 Hats Thinking	**Flowcharting**
Algorithms	**Force Field Analysis**
Analytical Hierarchy Process	**Goal / Wish**
Blockbusting	**Kepner-Tregoe Situation Analysis**
Boundary Examination	**Mind Mapping**
Brainstorming	**Nominal Group Technique**
Bug List	**PERT/CPM**
Crawford Blue Slip	**Problem Reversal**
Critical Success Factors	**Statement Restatement**
Decision Matrix	**SOLVE**
Decision Tree	**SWOT**
Duncker Diagrams	**Random Stimulation**
Expected Value Table	**Wildest Idea**
Fishbone Technique	**Wishful Thinking**
Five P's	**Z-Scores**
(Osborn, 1963; Hays, 1963; deBono, 1985; Hiam, 1990; Fox, 1987; Mason & Mitroff 1981; Buzan, 1991)	

These problem-solving methodologies have the implicit activity of consolidating individual perspectives into a group perspective in order to choose or create an optimal solution. Churchman's alternative assessment (1979), Mason and Mitroff's stakeholder assessment (1981), Saaty's priority scaling models (1980), and Fox's voting methods (1987) are examples of this type of activity. In addition, a review of early problem solving literature (Polya, 1957; Whiting, 1958; Osborn, 1963) identifies four generalized problem solving processes or activities: 1.) discovery, the uncovering of information; 2.) analysis, the decomposing of information into data and perspective; 3.) synthesis, the recombining of data into information; and 4.) choosing, the act of selecting a solution to the problem.

AUTOMATING GROUP PROCESSES

With the introduction of electronic based GSSs, these and other techniques have been automated with varying degrees of success. As an example, the Electronic Brainstorming tool from GroupSystems.com (a.k.a. Ventana Corporation) automates and extends the basic premise of the Brainwriting-type techniques (Nunamaker et al., 1997). SharePoint is a collaborative work environment offered by Microsoft.

SharePoint was created as a way to allow collaboration and increase the productivity of business team processes. Being a Microsoft product, allows for close integration with other Office products which is a coordination bonus. SharePoint allows you the ability to manage documents, organize content, share knowledge, provide collaboration environments, and search for people and information. Newer releases of SharePoint have built-in social functionalities. These features, allow organizations to build communities, share ideas and thoughts, and discover knowledge and resources. Below, we have identified five common group oriented activities and mapped SharePoint functionality to them.

As stated in the introduction, the purpose of this paper is to show how concepts underlying team based problem solving can become the pedagogical foundation for an information systems class. The following five examples attempt to show this approach. We pick five popular activities or methodologies used in groups or teams for project planning and show how to map these to SharePoint with screen shots from prototype SharePoint development for proof of concept.

de Bono's Six Hat Thinking – As discussed, one of most generic ways to facilitate group problem solving is to have group members provide information based on categories. This activity can been seen as a combination of the discovery phase and the analysis phase. The categories provide structure but the process allows free-wheel thinking within the category. One popular group technique is de Bono's (1985) six hats.

In the technique, de Bono has designed six categories of or perspectives from which to view a problem. Each category's perspective is some up with a focus. For example, the red hat thinking focuses on feelings and hunches; the emotional perspective of the problem. One would find a group member talking about how their "gut" feels about how to solve or react to a problem. Conversely, a blue hat

perspective focuses on the process for taking the next step in a plan to solve the problem. In the end, the group is taken through prompting questions and activities from the six perspectives in order to get a fuller description of the problem.

SharePoint can be useful in facilitating de Bono's six hat thinking (1985). We were able to accomplish this by setting up keywords on a field in a custom list. Once a member enters their unique point of view, a workflow is initiated that searches the record for specific keywords. When those keywords are found, the workflow assigns the appropriate colored hat based on the entry.

Based on our SharePoint workflow, the following colored hats are associated with the adjacent keywords.

Table 3
de Bono's Thinking Hats

Hat (Area of Concern)		Potential Keywords
White		Facts; Information; Data; Figures
Blue		Agenda; Thinking; Planning; Decision; Global; Overview
Black		Critic; Difficulties; Weaknesses; Dangers; Analyst; Risks
Green		Creative; Growth; Alternatives; Possibilities; Ideas
Red		Emotions; Intuitions; Hunches; Feeling; Instincts
Yellow		Logical; Positive; Benefits

Random Stimulation – Random stimulation is a brainstorming and creativity technique used to help members of groups develop more ideas. One simple strategy uses a dictionary to develop a set of words. These words should be randomly selected. Now, each word is reviewed and the associations created by your brain should be recorded. These words and associations become the genesis of new ideas and thoughts. Another more structured example is found in Roger von Oech's (1983) creative strategy detailed in his book "*A Whack on the Side of the Head*." Using a deck of 64 cards with different prompting questions, the activity works to help jar the thinking that may have been stalled. For example, a group working to solve a production line problem may have stalled in its thinking about possible solutions. One of the whack packs cards would be drawn and read out loud to the group – "Think like a kid"–and used to jumpstart addition discussions.

SharePoint can provide prompting words or questions to help individuals and groups generate ideas. One way to accomplish this would be to have a team member create an entry based on the problem they're trying to solve. The entry form, displays random cards from the Roger von Oech's *Creative Whack Pack*. The card is presented in a defined location on the entry form, where additional fields are available to enter new ideas or questions generated by the random stimulation. The workflow would keep track of the 64 cards that have been displayed and display a new card each time the button is clicked, until the randomized rotation starts over. SharePoint also allows the ability to track questions and ideas associated with each card, so those thoughts are never disregarded.

The entry form is available to all members of the team and has the ability to be edited at any time. This allows for collaboration, idea sharing, and thought tracking throughout the team without the need to be in the same physical location or time zone.

Force Field Analysis – Force Field Analysis is a process originally designed by the social psychologist Kurt Lewin (1947) in the 1940's. His idea was to identify those items or influences that both support you plan and that work against your plan. Once identified, the influences were scored as to their level of impact. The total scores from each perspective would help resolve the issue at hand. Figure 1 provides one visual of this thinking.

Stakeholder Analysis – Stakeholder Analysis is a very popular component of management; used broadly for strategic decisions and more narrowly for project management. Regardless of its scope, it is designed to solicit and ensure support of key groups of people or organizations – stakeholders – for projects. Stakeholder analysis is the technique to identify these stakeholders and solicit their input and opinions concerning the successful completion of the project. The techniques can be deployed at varying levels. (Babou, 2008; Savage et al, 1991; Mitroff and Linstrone, 1993).

Generically, the technique starts with brainstorming the list of stakeholders. From there, there exists many derivatives of the technique, but most look to have the team members rate the stakeholders on two characteristics; say "power concerning the project" and "interest in the success of the project." The final ratings are them compiled and displayed in a matrix using the characteristics and the axes. The results have the stakeholders fall into four natural quadrants (Figure 2). Assuming low to high and left to right as increasing values of the ratings, the upper right quadrant identifies the key stakeholders for the project. These are the critical stakeholders and concerns that must be addressed closely. Stakeholders in other areas are important and the techniques suggests are handled different: upper left stakeholders should be satisfied; lower left stakeholder should be monitored with some minimum effort; and, the lower right should be kept abreast of the project.

SharePoint, can help you through the whole stakeholder analysis. First, we built a SharePoint form that asks the individual or group to identify the stakeholders. We provided a list of people that might be associated with the project, as a way to keep members thinking about all the people that are affected by their work. Next, with a simple rating process, the stakeholders are identified by their power and interest in the project. The form asks questions about each stakeholder to help the group identify and understand their key stakeholders. Finally, the graph is automatically developed and used in the analysis phase.

Stakeholder Assumption Surfacing Technique (SAST) – SAST is a multi-layered business planning process designed and promoted by R.O. Mason and Ian Mitroff (1981) in their book *Challenging Strategic Planning Assumptions: Theory, Cases and Techniques*. The process is derived from the recommendations of dialectic thinking whereby emotion is removed from a debate and the facts are presented and studied to obtain truth, as Socrates envisioned it. The SAST process includes the concept of a structured debate which operates to present hypotheses, provide supporting or contradicting data as warrants, evaluate such data with group votes and ratings, and reach a logical conclusion around the problem's solution.

In a way this technique can be viewed as combination of the Force Field and the Stakeholder Technique combining portions of each. However, Mason and others (Mason, 1969; Mason and Linstrone, 1993; Mason and Mitroff, 1981; Churchman, 1981) have developed a more specific technique concentrating on the assumptive actions of the stakeholders. In their Strategic Assumption Surfacing Technique (SAST) they concentrate on the characteristics of certainty (low to high) – How certain are you of this assumption? – And importance (low to high) – how important is this assumption for the success of the project? The resulting matrix produces a set of important assumptions (upper right) that need validation and interestingly, a set of assumptions (lower right) that are identified as Important and Uncertain. Mason and others felt these to be key items for a successful analysis of a policy or planning problem.

DISCUSSION

Automating team processes will require a combination of information systems development knowledge and of the underlying concepts of team work. The incorporation of courses that discuss and understand team work can be found in various areas. The ability to build a simple computer system also resides in various areas. The most likely pedagogical home will be one that recognizes information technology and it interaction with human beings. One finds this combination in the study of informatics in general and more specifically with information systems.

The class envisioned around this area would combine students with soft skill backgrounds and students with application development backgrounds. One could imagine a student previous classes in psychology or small group theory finding a class that automates those theories appealing. A second student looking for a process to automate would also find well defined and documented activities appealing. The class envisioned would work to merge these interests and build students with practical backgrounds in building team oriented problem solving techniques.

SUMMARY

Employers value teamwork skills. Therefore it seems reasonable that teamwork skills are a key skill for students to learn and have at their disposal for their careers. Further, it would seem that knowing how to help automate and use key teamwork activities would be important content for business school programs. Building on this premise, this paper has presented a proof of concept using prototype automations of five basic team oriented tools. The students who understand the underlying premises of the activities and can encode them in company workflows for businesses will be greatly sought after.

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APPENDIX A
SCREEN CAPTURES

FIGURE A1
DEBONO'S THINKING HATS

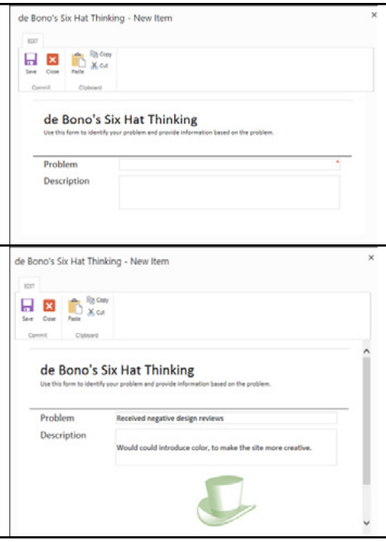
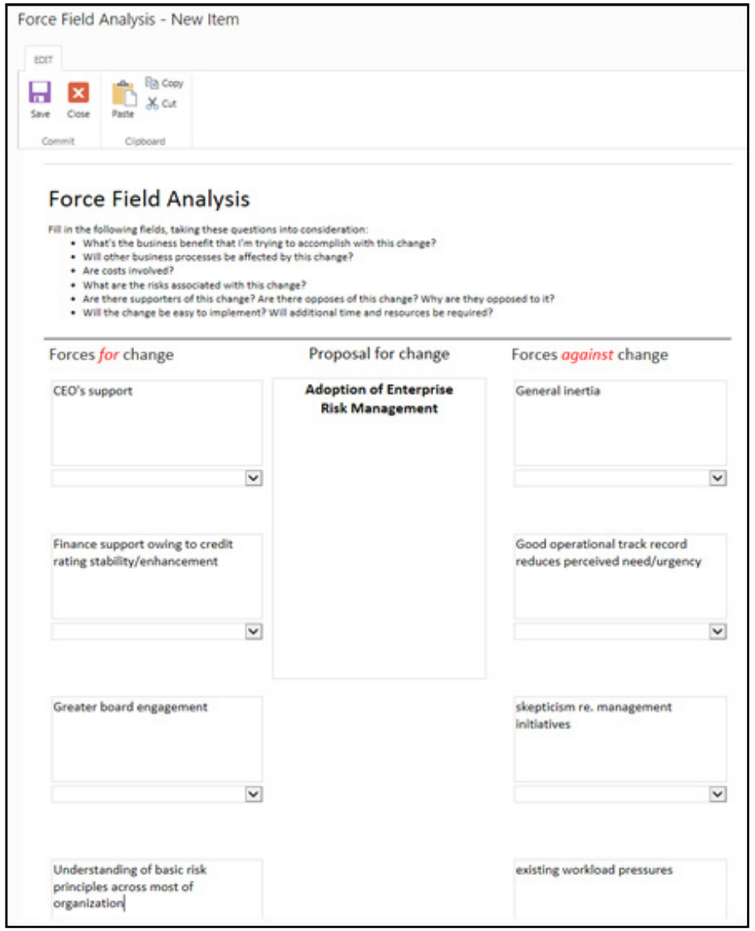


FIGURE A2
RANDOM STIMULATION

FIGURE A3
FORCE FIELD ANALYSIS



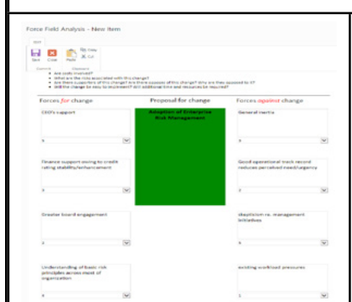


FIGURE A4
STAKEHOLDER ANALYSIS