Collaborative Planning: Empowering the User in a Process Support Environment

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Collaborative Planning (CP) is a means by which computer representations of a work process are created and modified cooperatively by a group of people. The need for involving many people in the planning process is the result of a trend which is many decades old, and which is enjoying a new level of awareness due to the Business Process Reengineering movement. CP empowers users within a workflow environment to have control over their own processes. CP is defined and four general requirements for a CP tool are given. The benefits and drawbacks of this new technology are discussed; Regatta Technology is offered as an example of a CP tool.

1.0 Introduction

The current trend for process orientation in management represents a significant departure from the philosophy that is used to run most companies today. In the first half of this century, Alfred Sloan showed that tremendous efficiencies of scale could be accomplished by structuring management like a factory with separate departments specializing in their own specific functional part of the management activity. The introduction of industrial revolution style thinking to management caused an economic boom like none seen before, and companies bigger than had been previously dreamed possible. Yet less than 50 years later we find ourselves in the middle of another management revolution that turns the previous notions upside down.[5]

In this paper we postulate that the forces reshaping our corporations are also creating an opportunity for a new aspect of software, termed Collaborative Planning (CP), will most likely appear not as a new kind of application, but rather as an enhancement of existing software applications. The effect of CP will be to help organizations respond to the dynamics that they currently face. After a brief discussion of management trends, we will explore the requirements of a CP product, the benefits likely to be gained, as well as the inherent drawbacks of this new technology. Finally we present Regatta Technology as an example of a collaborative planning product.

1.1 Business Process Reengineering

Business Process Re-engineering (BPR), a term coined by Michael Hammer[13], is today's hot buzz word in management circles. It refers to the activity of reevaluating how the organization does its work and redefining this work in terms of processes designed to satisfy a specific goal. Each task is considered in relation to the process as a whole and ultimately to the satisfaction of the customer of the process.

In those businesses divided into departments along functional lines, it is possible for the functional departments to become very isolated from the customer. The department tends to optimize its own convenience, potentially losing sight of the needs of the ultimate customer. Such departments may measure themselves in terms of the number of cases handled per employee while ignoring how long it takes to handle a single case. Their factory-like organization encourages introduction of process steps regardless of the likelihood of cases needing them. Like a machine it is set to blindly process each case with a minimum of failure.

A process orientated approach means, at the simplest level, bringing a representative of each of the traditional functions into a team which works together to process a specific product or service. The team can specialize to meet the needs of that product or service, removing redundant steps, adding in steps for special requirements, and fine tuning itself for the needs of the customer.

BPR goes far beyond this by asking the executive to forget about the traditional departmental functions and invent a new process from the ground up, often redefining job functions.[14]

There is ample evidence of the popularity of the principals behind BPR. IDC estimates that the 16 largest management consultant firms in the US have provided $750m in BPR consulting in 1992 alone, and predicts that 1993 will be well over $1b. There are scores of courses and seminars to train

potential BPR consultants. The number of new books on the subject is almost alarming.

Stories of successful BPR are even more impressive. IBM Credit reduced the time to prepare a quote for buying or leasing a computer from 7 days to 4 hours, while increasing the number of quotes by a factor of one hundred. Federal Mogul reduced the time to develop a new prototype from 20 weeks to 20 days, thereby tripling the likelihood of customer acceptance. Even the US Internal Revenue Service re-engineered their processes so that they are able to recover 33% more dollars from delinquent taxpayers with only half the staff. Michael Hammer points out that goals of cutting costs in half, and cutting response time by 80%, are not unreachable.[13]

Thomas Davenport notes that BPR has roots that can be traced well back to the middle of the century and is a logical outgrowth of the quality movement with its focus on outputs and customers.[6] W. Edwards Deming is a good example of an evangelist of quality who recommended concentrating on processes and the continual improvements of them. The concern for greater efficiency is timeless, and the components used to accomplish this are well tested. This is sufficient evidence that BPR is not simply a fad that will fade away.

Process orientation is not new in Japan. Lester Thurow argues that Japanese firms spend two thirds of their research and development budget on new processes and only one third on new products -- the reverse of American firm's investment proportions. The Japanese term, "kaizen", refers to the continuous improvements of processes, something deeply ingrained in Japanese corporate culture, due in no small part to the enormous popularity that Deming enjoyed in Japan. Kaizen is commonly considered to be the reason for Japan's enormous commercial success today.

It is Information Technology (IT) that brings the new dimension to process reengineering, and is the main reason for the current fervor around BPR.[22] Consider for a moment the reasons behind the functional organization of pre-IT companies. The ability to handle a large volume of cases was limited by the sheer bulk and accessibility of the information needed to process the cases. In order to handle a case you needed to be physically close to where the records were stored. Specialization of departments allowed them to keep the amount of ancillary information within manageable limits as the number of cases grew larger.

IT changes this in a dramatic way. A user of on-line information no longer needs to be physically close to where the data is stored. No longer is it necessary to send an application to be processed in a special location by different people and the associated inherent delays. A person with an appropriate information system can single-handedly perform what used to take a number of departments. When others need to be brought into the process, IT can help support the interactions between them. These capabilities of IT allow executives to find radical new processes with dramatic results.

To cite a more specific example, it was the impossibility of having the correct purchase order at the correct receiving dock that justified the existence of the Ford accounts payable department. Once it becomes possible to verify the purchase order at the receiving dock, the extra overhead of accounts payable became unnecessary.

1.2   The Threat and Promise of BPR

The main benefit of BPR comes from the relationship between the process and the product it produces: the better the process, the better the product. Some Japanese believe that if you pay attention to the quality of the process, the quality of the product takes care of itself.

A second benefit comes from making better use of IT, and redesigning processes to involve fewer people and take fewer steps.

A third benefit is that the new redesigned jobs are more enriching to the workers. No longer are they a cog in the machine, making one indiscernible part after another, but someone who is taking an active role in satisfying a customer, either an internal or external one. This is an improvement over the trend which scientific management brought to the workplace.

Companies are being forced to adopt BPR measures because of the tremendous pressures of competition from those companies who already have. In some cases adoption of radical change has been used in a desperate, yet successful, measure to avoid closing down.

Customers are more demanding and are getting what they demand more often. Successful companies are outmaneuvering others by discovering and providing to customers exactly what they want. This raises the stakes for everyone. Companies need to be able to respond quickly and effectively to changes in customer demand. The ability to respond to customer demands and to lower the costs of doing business is giving those companies a competitive advantage.

2.0   Meta-Processes

The central issue in taking advantage of BPR is change. There are two kinds of change which are important to consider: "process improvement" and "process innovation." The difference is not simply magnitude -- it is possible to have a complete redesign of a small department, and to have a large incremental improvement. The difference is really whether the change is imposed from outside or inside the organization being changed, and whether the change redefines basic job functions.

2.1   Process Innovation

Process innovation refers to a major change of an organization as demonstrated by the examples of BPR success where the main processes are reevaluated from the point of view of the customer and redesigned from the ground up. Such changes must be instigated from the top of the organization and supported throughout the organization.

Process Innovation involves redefining job descriptions and redefining the functions that are involved in a process. A process may cut across many functional lines. In order to change job functions the reengineering must be supported at a level that is above the departments that participate in the process. Consider the much publicized restructuring of Ford's accounts payable department. The idea to eliminate the accounts payable function can not be expected to come from a member of that department, nor really from any of the other departments. This decision must be conceived at a level above all the departments.

This places a lower limit on the level that must be involved in a major process innovation. For this reason the major reengineering of business processes is forced to affect a majority of the company and can not be motivated from below.

Davenport advises that an organization wishing for successful process innovation should: 1) identify processes for innovation, 2) identify change levers, 3) develop process visions, 4) understand existing processes, and 5) design and prototype the new processes. A process innovation program can not be successful unless it is followed up by a program of continual process improvement. A company that is not successful at continual process improvement will not be successful at process innovation.[6]

International Systems Services Corporation, a business process consultant has identified five steps in the process of change: 1) analyze leverage points, 2) identify process breakthroughs, 3) design business processes, 4) implement business processes, and 5) institutionalize continuous improvements. In this case it is even more clear that both kinds of change go hand in hand.[1]

2.2　Process Improvement

Process improvement, like the Japanese term "kaizen," refers to the continual fine tuning of processes that are already in place. For example a particular group may decide to handle its piece of a process in a different manner, while providing the same basic function. Process improvement can be motivated from the bottom up by incorporating suggestions from workers in a manner reminiscent of Total Quality Management (TQM). In order for workers to be empowered they need to have control over the processes they participate in, and to improve them when they identify a problem.

2.3　Barriers to Process Change

Being creative and innovative enough to come up with the optimal process redesign and implementing the information system is only part of the work. The largest amount of labor will go to working with the people that will be involved in the process, helping them to understand and change their habits to the new way of working, and possibly retraining some of them to perform new and different functions. The greater number of people involved, the more difficult it is to implement, and the greater risk for failure. It stands to reason therefore that any means which can isolate the changes to a smaller set of people, or possibly the minimal set, will be advantageous when it comes time to implement the changes.

Of utmost importance when planning process change is to consider who the stakeholders are, and to bring them into the planning as early as possible, and keep them involved throughout. The more directly that the stakeholders can be involved in planning the new process, the greater chance of success there is.

Another roadblock for easy process improvement appears when a small part of the organization wishes to make a change just to their part of the plan. If the process is represented as a single monolithic plan, then all of the people and groups involved in that process need to be part of the change approval process, even if their own functions are unaffected by the change. The bureaucratic overhead may be considerable. In some cases the advantage gained from some very small adjustments to the process may be outweighed by the cost and trouble of getting all the approvals, thereby forming a barrier to the introduction of small changes.

If the ability to change is difficult, the problem is compounded by the difficulty of getting the process right the first time. The people involved in the work are often unaware of exactly how the work is done. Shoshana Zuboff points out that skills picked up on the job form tacit knowledge which the worker is unable to express verbally either because they are unaware of exactly what they do, or because they lack the vocabulary and experience of discussing work habits.[31] An example is the difficulty of describing how to balance on a bicycle. To change a process, workers are usually interviewed to discover the current process, but since the interview is limited by the workers ability to describe the work, the process specialist must also observe activity. Even observation can not pick up the reason why a particular action was made in favor of another.

2.4　Different Processes for Different Groups

While change usually refers to a difference in the processes over time, there is also evidence for needing a difference in the process across the organization. Different groups work in different manners. It stands to reason that for each group to operate optimally they should be able to have their own customized version of a given process. Greenberg has pointed out that groupware that treats all individuals and groups the same has a high probability of failure.[10]

Having a customized process is exactly what process orientation is about. Sale of a large computer system and sale of a reference manual should not be forced to follow the same process merely because they are both sales. Taken to the logical extreme one could imagine a company which has a unique process for selling each different product, and this may not be inappropriate. Yet all of these processes are related because they should appear, at least to the customer, in some sense the same: a sale. Therefore it is not sufficient to let different process teams have different processes, they must be able to have different versions of the same process.

3.0 Social Aspects of Process Support

IT will make two major contributions to BPR. The first is the ability to remotely access information which allows a single individual to do many things directly. Since information can be delivered anywhere, it should be delivered to wherever it can be of the most use, and that is usually wherever the customer is. Many companies are seeing tremendous process improvements by providing information systems that allow salespeople to, for example, directly check a customers credit, verify inventory of items, schedule manufacturing time, or generate complex quotes on the spot. All of this can be done while the customer is waiting.

The second contribution is when the process involves a number of people, IT can be used to coordinate their interactions. As information access becomes location independent, teams become geographically dispersed and become more dependent upon electronic communication. "Process Support" software or "Work Flow" software is needed to provide this communication. CP is primarily concerned with this process support technology.

Like any groupware, CP must take into consideration many social factors. The office environment is more complex than it seems. Many interactions happen at an unconscious level or in a natural way that belies their importance. Introduction of new technology into a social setting is a veritable mine field until the users and technology adapt to each other, assuming that they are able to adapt. The next few sections point out a number of pitfalls that we uncovered in the course of development and early testing of our prototype. This can not be a complete listing because CP is a immature area and is still largely untested.

3.1 The Dangers of "Programming the Organization"

Since work flow and process support systems are often implemented by people intimately involved in developing software systems, it is all too easy to view the steps in the process as being like a program to be executed by the organization. While the skills needed to analyze the process and identify the individual steps are similar to the skills needed to program, the end result is very different. A computer program is very control oriented. In a certain sense a well written computer program leaves the computer no choice but to produce the right answer.

Taking a programming approach to process support tends toward controlling the people and forcing them to do the right thing at the right time. This is, in effect, de-skilling the work, and trying to automate it. An early supporter of this approach was Frederick Winslow Taylor and his principles of scientific management.[28] While Taylor expounded more than eighty years ago the importance of attention to process, his ideas fall far short of BPR because of his assumption that there is a single ideal design for any work process, and his view that people should be subordinate to the process. Robert Howard points out that "Taylorism is alive and well in the assumptions of many technology managers [who] see computer technology, first and foremost, as a means to eliminate, or at least minimize, the human element in work."[16] Besides the obvious lack of appeal to the workers, there are other serious problems that result from trying to program the organization.

Programmed organizations can not handle exceptions beyond those exceptions expected and provided for in advance. This means that during the investigation and design of the process, much attention must be given to every possible point of failure, and a programmed response must be provided. A side effect of having to provide for all of the possible exceptions up front is that the cost of introduction of the new process is significantly higher. This forms a barrier to adoption. Since so much effort goes into initially creating the process it gains a sort of momentum and becomes very hard to change. This decreases the ability of an organization to respond to change from external sources.

In a programmed organization the worker has lost control of the processes and the work. There is no room for creativity and experimentation; key elements that would lead to spontaneous process improvement. Most workers find this unpleasant and are unmotivated.

As a side effect of the cost of creating a process, the goal must be to implement a single best plan, and to use the same plan for all groups. Since different groups are composed of different people with differing levels of expertise, it is appropriate for them to make use of different processes to accomplish the same task. Optimizing the process to a particular group is very expensive in the programmed organization.

3.2 Empowering the Users

Andrew Clement makes a strong case for the need to use information technology to empower the user.[2][3] He recognizes two meanings of empowerment in the context of the workplace. The first meaning comes out of TQM and BPR and refers to the additional responsibilities that a worker gains as the organizational hierarchy is flattened. "Empowerment means that operational decisions will not be made hierarchically, that knowledgeable workers must feel comfortable in making decisions, that managers must provide counsel rather than directives, and that information and our conceptual models of how to use it are the source of decisions"[4]

The second meaning might be termed "democratic empowerment" because it emphasizes the ability for an individual to have control over his or her own situation. Workers empowered in this way might be able to make improvements in any process in which they play a role. Clement presents three examples where such empowerment lead to changes in the work environment and processes which "TQM and business process reengineering advocates would be proud of." Given the ability to change, they made improvements far beyond those that had been considered by the traditional management. The conclusion is that process support needs to be "supporting" instead of "enforcing."

An example of a product widely criticized for its enforcement of a set process is the Coordinator.[8] This product embodied a static model for negotiation based upon a finite state machine. Perhaps the greatest reason cited for the low adoption rates of the Coordinator was the negative reaction that users had to being constrained to a particular set of moves, and the feeling of being forced to do something they did not want to do.

Traditional workflow has been often criticized for its lack of flexibility. Too often the flow definitions are too simple to handle the richness of real world problems. A study by SRI found that lack of flexibility was a common complaint among work flow users.[18]

3.3   Intelligence behind the Rules

Failures at automating office work may arise from the attempt to literally implement the rules of the office. Workers in an office work under the assumption that there are a set of rules that they are following. While the rules exist, the workers have a great deal of flexibility in implementing them. It is the intelligence behind the use of the rules that allows them to work. Upon close examination studies[15] have found mutually contradictory office rules; yet the office still functions on the judicious application of these rules. Blind coding of the office rules into a computer that lacks the common sense of the workers may yield disastrous results.

A good example is the Kanban system of inventory control cards. In this system the set of rules is very simple, but because people were the carriers of the cards they could make value judgements about which cards were urgent, and which cards could be "pocketed" and delivered later. This prioritization made the system operate more smoothly and efficiently than if the system were implemented literally on a computer system.

A key point to keep in mind is that office workers currently enjoy a great deal of flexibility in how they implement office procedures. This flexibility may account for a large part of the effectiveness of each worker. It is critical that any replacement system allow for the same degree of flexibility and empowerment.

3.4   Inadequacy of Data Flow

Modeling the work process as a data flow model is initially attractive because it is so similar to the way information is exchanged on paper, which is physically transported from person to person. Yet the first important contribution from IT lies in the location independence of information. Modelling the process as documents flowing from person to person gives a location to that information which is contrary to this benefit. Even attempts to work around this by making every document flow to every person gets conceptually difficult when the process involves parallel paths. A better approach makes all documents potentially accessible at every stage so there is no need to represent the flow of data.

3.5   Separation of Planner and User is Undesirable

One theme common to all approaches to reengineering organizations is to involve the worker as much as possible at every stage.[6][13][11][19][31]

Davenport states that a source of difficulty in BPR is the fact that process design can not be fully participatory. "Options can be solicited and objectives and progress communicated, but regardless of the philosophical value of participative cultures, not every worker can materially contribute to a process redesign that affects thousands of workers". This make major process innovation inevitably top-down.

Is this an inherent limitation, or a practical limitation which is also an opportunity for a technology to answer? What are the boundaries between those innovation changes which can only be handled top-down, and those improvement changes which might be motivated by the workers? How much can users be empowered to be in control of their processes?

4.0   A Definition of Collaborative Planning

4.1   Planning and Coordination

Planning is used here to mean the activity of constructing plans of action which will be used to coordinate future work. There exist two sorts of plans: plan instances and plan templates.

We use the term "plan instance," or more loosely just "plan," to denote a specific plan for a process which has begun enactment. It involves specific people and organizations, and includes details of the situation. The plan to satisfy a particular customer with a specific order is a plan instance.

We use the term "plan template" to refer to a plan that is prepared in advance to anticipate a kind of situation before the details of the actual instance is known. For example, an emergency evacuation plan is prepared in advance of any real emergency so that when it is needed it can be instantiated quickly. It serves as a starting point for the specific plan.

A plan can be derived for two different purposes: one is a plan for work and another is a plan for coordination. A plan for work breaks the process into tasks, each of which might be broken into finer and finer detail until one achieves a very detailed description of exactly what will happen to achieve the goal. There is no limit to how detailed a plan can get, but at some point it will become so detailed that the effort to keep the enacted plan up to date rivals the effort to do the work. A plan for work is very important if you wish to program the organization, but our goal is to support the organization not program it. A plan for coordination breaks tasks into subtasks, but the guiding principal is that tasks should be further subdivided only if different people need to be involved in different subtasks, or if it is important for other people to be aware of which particular subtask is underway.

An example of the difference can be taken from the software engineering field. The tracking of a bug report involves a number of people performing a number of tasks. At some point in the process a programmer will need to fix the software problem. In order to fix a problem, a software engineer needs to perform a lot of different tasks, editing files, use of analysis tools, compiling programs, testing, etc. It is rarely important for other member of a team to be aware of what the programmer is doing to this level of detail. Although the programmer is doing a number of different actual activities, as far as the rest of the team is concerned he or she is involved in only one aggregate activity, that of fixing the software problem. Therefore a plan for coordination would only represent this activity as a single task. The guidelines for decomposing tasks by coordination provides a limit for decomposition. This is important because in our experience novice users tend to create models with far too much detail, which become difficult to use because of the tedium of keeping the models up to date.

4.2   Work and Meta-Work

The process plan is a description of the notable activities to complete a goal. The creating of the plan is the planning activity, a sort of meta-work. A plethora of tools are available that help support the work activities themselves through the use of plans of one form or another. What is of concern for CP is how the plans themselves are created. For most systems the activity of plan creation is outside of the system itself, something to be done at a different time (before) and usually by a different person (a programmer) than those involved in the work. A CP tool should include features to support the planning activity, including the interactions between people that necessarily take place during the creation and evolution of plans.

It is our belief that the large number of process support and workflow systems will soon realize the limitations inherent in the separation of planner and worker and will evolve to have collaborative planning capabilities. Indeed there are already several multi-user project managements tool that incorporate some CP requirements. Our goal is to identify the common features that all such systems will need in order to be successful, and subsequently some of the inherent drawbacks.

5.0   Requirements for a Collaborative Planning Tool

We have identified four general requirements for a CP tool to be successful. First, the tool must designed so that plans can be created by an average user. Second, it must have some features to support multi-user plan creation. Third, it must be able to support modification of active plans. Finally, it needs to support differentiation of plans for different groups.

5.1   Support for End Users

A collaborative planning tool is designed to be used by end users. It needs to be easy enough to be used without a lot of specialized training. An analogous situation is the production of financial reports compared to the introduction of spreadsheets. Spreadsheets did not enable any capabilities that were not already available to those willing to hire a programmer. What the spreadsheet offered was a way for end users to create reports and calculations without having to program.

The key to making plans editable by end users lies in a having a simple clean representation of plans. Effort to keep the number of different objects to the smallest meaningful set is critical. In other words, less is more. Keeping the description of plans simple, may form a limitation on what the tool can do. the temptation to make the "full featured" plan description language must be avoided.

Again the analogy of the spreadsheet is a good illustration. Compared to a full featured programming language with report formatting features a speadsheet is a significant limitation on your options of dynamic layout. There are many report formats that can not be done conveniently in a spreadsheet. Yet spreadsheets made such a large body of calculations and reports available to the average user as to justify their existence. The line between enough and too many features is never clear, but each new feature to the plan description should be carefully weighed and included only if absolutely necessary.

A number of process support tools are appearing that support a graphical representation of plans. Most project management tools have at least a PERT chart representation. Yet some tools require the information to be entered in a form different from the graphical display. End users expecting a WYSIWYG environment will want to construct and edit the plan graphically.

5.2   Support for Plan Collaboration

Responsibility for the work and responsibility for the plan are closely related. Michael Hammer states: "Companies that have reengineered don't want employees who can follow rules; they want employees who can make their own rules. As management invests teams with the responsibility of completing an entire process, it must also give them the authority to make the decisions needed to get it done."[14] Involving a group in the planning activity implies that a group is involved in the responsibility of the task. In larger tasks it is quite common for different people to be responsible for different parts of the tasks, so the groups approach is justified.

While empowering multiple people to create and modify plans simultaneously, the collaborative planning tool must give the planners control over the changes. A planner who is responsible for the result of a plan fragment must have some assurance that his or her plan has not been improperly modified. Reflexively, that planner should not be able to change someone else's plan fragment.

We draw as a conclusion from this that the planning tool must support some form of plan fragmentation where different capabilities can be assigned to different people for different fragments. At a very minimum the plan fragment should have an owner who is allowed to change all aspects of the plan, and who can assign other capabilities to others. The requirement for fragments seems to come directly from the desire to allow multiple people to be involved in the planning process, and not from any specific implementation goal, much in the same way that file ownership and access controls are a fundamental requirement for a multiuser file system.

There are potentially any number of ways that processes could be divided into fragments. Different models of interaction might suggest different ways of breaking up the process plan into manipulatable fragments.

Process instances are composed of a number of plan fragments, but plan templates must be a single fragment. Since each person has control over a plan fragment, it stands to reason that the plan fragment should be initialized with that person's template for that fragment. The act of creating a complete plan instance from a collection of plan fragment templates is an important part of CP. The resulting complete plan is built from fragments that take into account the individual needs of the people or groups from whom the templates were taken. When different people are involved, different templates are brought in, thereby creating a plan that is customized for the set of people involved in that instance of the process.

We conclude from this that if the process tool supports plan templates, then in order to support CP, not only do the templates need to represent plan fragments, but there needs to be a plan binding mechanism which allows a complete plan to be constructed from the proper collection of plan fragment templates.

While CP allows people to view each others plans, invariably some members of the organization do not want their plan known. In order to prevent a breakdown in the use, the CP tool must have a privacy mechanism that gives the plan owner control of who may view the plan.

5.3   Support for Process Change

The end users involved in the planning will neither be experts in how to plan, nor will they be able to devote a large amount of time. It is reasonable to assume that they will not get the plan correct from the start. Inevitably occasions will arise for which the plan is not prepared.

The answer to this is to allow changes to the plans after the process has started. While this may appear initially to be an implementation issue, we believe that without the ability to change process plans on the fly, the end user is burdened with having to produce very complete very formal process plan templates, or to turn to specialists to assure completeness, which would interfere with the collaborative aspect of the tool.

Being able to change an active plan is not enough. The user must also be able to change the plan template at any time without undesirable side effects in active processes. An instance of a process by its nature will persist for a length of time, in some cases for years. If the organization is continually improving there may be several versions during the time the instance is active.

We have found the proper solution to this to be a separation of the instance from the template. In general, once a process is started, to remain consistent it should complete with the same version of a process. The change of a template should leave the instances unaffected. The system must be able to support instances with different versions of a process being enacted at the same time.

CP tools must accommodate users who have been familiar with a particular process and who unexpectedly discover that the process has changed. The process must be accompanied with enough explanation so that a user confronted with an unfamiliar step in a process can immediately find enough information to be able to able to take the appropriate action.

5.4   Support for Individual and Group Optimizations

Since groups work in differing manners, a collaborative planning tool must support a way for each group or individual to specify their own versions of plan templates which are optimized for their group.

The process support environment is directing workers' actions, so the process plan carries some authority while it is being enacted. Though it is critical that users be able to change their own processes, it is also critical that the inappropriate version of a process be prevented from use. It must not be possible for a person to forge a new process, and then to run it at the authority of someone else. The system must enforce a proper mapping between authority of a process and the designer of a process.

In practical terms there will be a large number of plan template types. While the system allows each person to have their own version of a template, it would be tedious if everyone was forced to have every kind of plan template. From experience we have found there needs to be a mechanism to allow users to specify another place to "inherit" plans from.

6.0   Benefits of Collaborative Planning

6.1   Better Plans

As a company enters into continuous improvement, a CP tool allows better plans to evolve. Each member of the organization can improve their own plans when ever a potential improvement is identified. In accordance with the principles of TQM, ideas for plan improvements may come from

the people doing the job that would not have occurred to a centralize process plan effort. March and Simon argue that decentralized planning is always at least as good as centralized planning, and usually much better.[19] Removing the overhead of making a change empowers people to make the change. The result is an organization that is able to learn from the way it works, and to improve, much like the learning organization suggested by Senge.[23]

6.2   Ability to Experiment

It is easy for people to test new ideas. If the plan is determined to be faulty, the ability to modify plans on the fly allows for recovery. The built-in documentation of the process helps others to keep informed when they experience a process step they are unfamiliar with, or to learn a process in the first place. Through experimentation in live situations people may come across solutions that are not apparent in a more abstract situation. Since different teams are allowed to have different plans for the same situation, plans that are optimal for each particular team can be found.

6.3   Process Capture

A CP tool can be a help when the process is unknown, but the workers know what to do. By adding to the process as it happens one can end up with a record of what happened as well as a preliminary template for the next time. March and Simon point out that definition of new processes is one of the most important activities of any organization.[19]

6.4   Improvement at all Levels

Experimentation and improvement can be made at all levels. Top level plans can be modified to make use of different combinations of services from lower levels. Simultaneously the services of the lower levels can be improved. This situation has been compared to the self-similar aspect of fractals in that you see the same activity happening at the same time at different levels of granularity.

6.5   Save Planning Time

A CP tool has an advantage over a traditional planning tool in that the single user bottle neck is avoided. Each individual or group is responsible for keeping their own plans up to date, effectively distributing this activity away from a central control out into the work force closer to where the work is being done.

The plan fragment templates allow complete plans to be constructed quickly and automatically. The complete plan is customized for the groups that are involved in this process instance.

6.6   Better Feedback

A CP tool is designed to be easy to understand. If it succeeds in this goal, more people from the organization can be involved in the planning process, and feedback from all people involved is more accurate.

A CP tool surrounds the problems associated with process discovery through interviews and observation by allowing users to directly manipulate and experiment with processes. Tacit knowledge is learned by trial and error; a CP tool allows processes to be discovered and improved by trial and error, in order to tap some of that tacit knowledge.

7.0   Drawbacks of Collaborative Planning

7.1   Planning is Unfamiliar to Some Users

The most predictable drawback is that everyone may be expected to take part in the planning activity. This is a new role for many people, and in many cases a new skill that needs to be mastered. The introduction of word processors into the workplace allowed people to be able to compose and type (or even typeset) their own letters, memos, and documents. Yet a barrier appeared to those who were not proficient in typing which had been traditionally done by secretaries. Following the introduction of word processing many office workers needed to improve typing skills in order to achieve the real benefit. Learning this new skill did not come easy to all workers. CP as well as the process movement are no exceptions: people will be uncomfortable at first with the amount of planning they need to do.

7.2   CP is a New Tool to Learn

The introduction of CP means that people will need to learn yet another tool in the workplace, something most workers are loath to do. This is somewhat ameliorated by our observation that processes most often belong to a team of people as opposed to individuals. The individual is happy to use the process that works best for the group as long as the group is working well together. There often appears an individual who is an early adopter of the tool, and becomes the expert for the group. This person either volunteers or is appointed to maintain the plan templates for the group. Similar behavior has been observed in groups of people using spreadsheets where there is often a self appointed spreadsheet expert who supports the others in the group. The conclusion is that while there is a burden of learning a new tool, this is somewhat, but not completely, eased by having an individual create and maintain the templates for a group.

7.3   Unpredictable Effect on Privacy

The most controversial issue is one that CP has in common with all groupware, which is privacy. As people's actions are written down, the question arises as to who should be allowed to view the plans. People who are not used to disclosing the way that they accomplish tasks will be uncomfortable at the least, and in the worst case may not be willing to make use of the tool. Some people may regard their plans

as their competitive advantage and may not want others to know how they accomplish things.

Collaborative planning, if used in the intended way, goes a bit further because people are exposing incomplete and informal plans for others to see, which many may regard as unprofessional to let others see. An opposite effect detrimental to the purpose of CP might be the embellishment of plans in order to forge an artificially professional appearance or to create the illusion of progress when there is none. There will naturally be a period of adjustment until the use of such tools becomes accepted, and until the correct privacy assurances are found and integrated into the CP tool.

7.4   Planning without Thinking

Like other tools that have simplified work, there are bound to be some negative side effects of making planning easier. Ken Olsen, Digital Equipment Corp. founder, has criticized the use of spreadsheets: "It becomes too easy to make projections, and [too easy] to believe in the numbers the spreadsheet contains."[20] Word processor use has been blamed for lowering the quality of writing; a section once finished may never get updated and repolished. A similar effect is bound to be observed where people bring in complex plans with little thinking about the specific situation. Like many software tools, the first draft can be made to look superficially as good as something that has many hours of thought and polish put into it. It will be difficult to tell rough plans from finished ones.

7.5   Threat to Status Quo

Any time you introduce a new technology it upsets the status quo power balance. Directly affected will be those performing full time planning who will see their job being given out to all workers. There will still be a need for planning specialists, but at a reduced level. Another area threatened by this technology is management in general. Traditionally the planning and coordination has been done by management. CP will help flatten organizations, which means less management in general. One needs to break a few eggs to make an omelet.

Workflow in general is often viewed by executives as a way to trim the work force. Many of the success stories are about teams that have succeeded in raising their output level while reducing the number of people on the team. Cigna Reinsurance division initiated process reengineering with the statement, "If we succeed, half of us will no longer have a job in this division, if we fail, none of us will."[6] If key people are threatened they can block the adoption of the technology. One should expect it to take time for the culture of the group to change and to accept new technology of this nature.

8.0   Regatta Technology

The Regatta Project was started in 1991 within Fujitsu to explore groupware technologies. The three goals are to develop software to 1) support coordination of work, 2) help users understand how their group works, and 3) support the change and improvement of work processes. With these goals in mind, and generous sponsors in Japan, Regatta Technology was developed.[24][27]

The first prototype was developed on top of Conversation-Builder[17] with the help of Simon Kaplan and his team at the University of Illinois. This was then tested in a laboratory environment while we implemented the real version in C++. By continually testing at several beta sites within Fujitsu and using it ourselves, we were able to continually fold in design improvements at every step. For the most part we simply followed the recommendations of people like Don Norman, Jonathan Grudin, Clarence Ellis, Lucy Suchman, Tom Malone, Simon Kaplan, and too many more to mention. We ended up with something that is quite a bit more useful than we had really ever expected at the outset.

8.1   Shared Space for Collaboration

Primarily, Regatta offers a shared space for collaboration[21] which contains data, artifacts, and a collection of plan fragments. Access to the space is allowed only to participants which have been specified. The system provides a list of all active tasks on the plans, as well as the options for each of those tasks. A record of user interaction is kept to provide a history of the process to participants. Platform independent forms allow for consistent presentation of data on any client platform.

8.2   Visual Process Language

We spent a great deal of effort to come up with a graphical representation of a business process that is elegant and easy enough to use, yet powerful enough to handle all the needs of an average business user. Regatta includes a graphical planner (editor) that allows an end user to draw Visual Process Language (VPL) diagrams and to edit them directly. The same VPL diagram is used to display the current status of the process.

Zisman did early work in the area of representing office procedures with Petri Nets.[29][30] VPL is a parallel language which has properties similar to Petri Nets but it has been specialized for the needs of collaboration and work processes. VPL is quite similar to Ellis' Information Control Nets[7] except VPL is simplified by omitting the document flow.

Plans are composed of stages which represents task to be done. A stage can be active or inactive to indicate whether it is time for that task to be done. Stages can be programmed to respond to particular events, and to send events to another stage in order to activate and deactivate each other. Stages are represented by a bisected ellipse with the role assigned to

the task in the upper part, and the description of the task in the lower.

Stages are programmed by placing options (another graphical object) on them. An option looks like a small circle on the edge of the ellipse with an arrow pointing to the stage that will receive the event. When the stage is active, the option appears as a menu item to the user. Choosing that menu item triggers the option, sending an event to another stage, possibly activating it, and optionally deactivating the originating stage. Four other nodes of lesser importance exist to fill out the capabilities. Experience has shown that VPL is simple to understand, yet powerful enough to represent a wide variety of processes. More completed descriptions of VPL can be found in [25] and [26].

8.3   Plan Binding

Regatta supports plan fragments. A user who is assigned to a stage can invoke a plan template containing subtasks to complete that stage. The subplan for a stage forms a different plan fragment for which that user is the owner. Plan owners may make any modification in the plan through the graphical editor at any time during the process enactment. The enacted plan is a copy of the template, so changes to the template, do not effect the active process, and vice-versa. A subplan for a task can also be in a separate collaboration space thereby assuring privacy, and only the result is communicated.

Regatta does not require a plan in all situations. Any stage can be handled manually. Each user who goes to the trouble

of providing or improving their templates for a particular task will also receive the benefit. It is important for success that the same person receive the benefit that does the work.[12]

8.4   Status

Regatta Technology has been in beta test in real office use since June 1993 in a number of sites within Fujitsu. Since Nov 1993 it has been available for external beta testing. The largest installation involved a team of 18 software engineers who used Regatta to track over 300 independent modules through 5 phases of development which lasted 8 months. Quality assurance was tracked through each phase. Within weeks of installation Regatta was supporting development processes. The ability to modify plans was shown to be essential to keep up with the changing understanding of the process. The result was that productivity was substantially improved, the final quality was assured by the knowledge that every module had been correctly processed. Today, the processes of that team are still being improved.
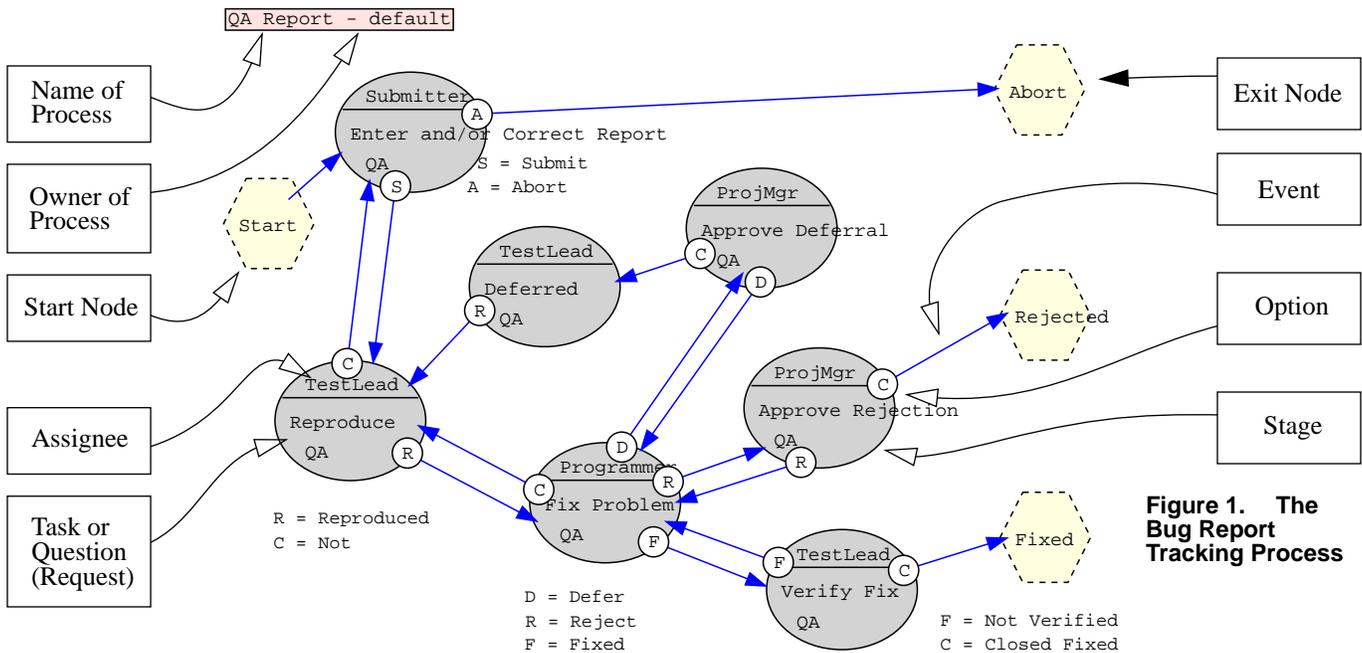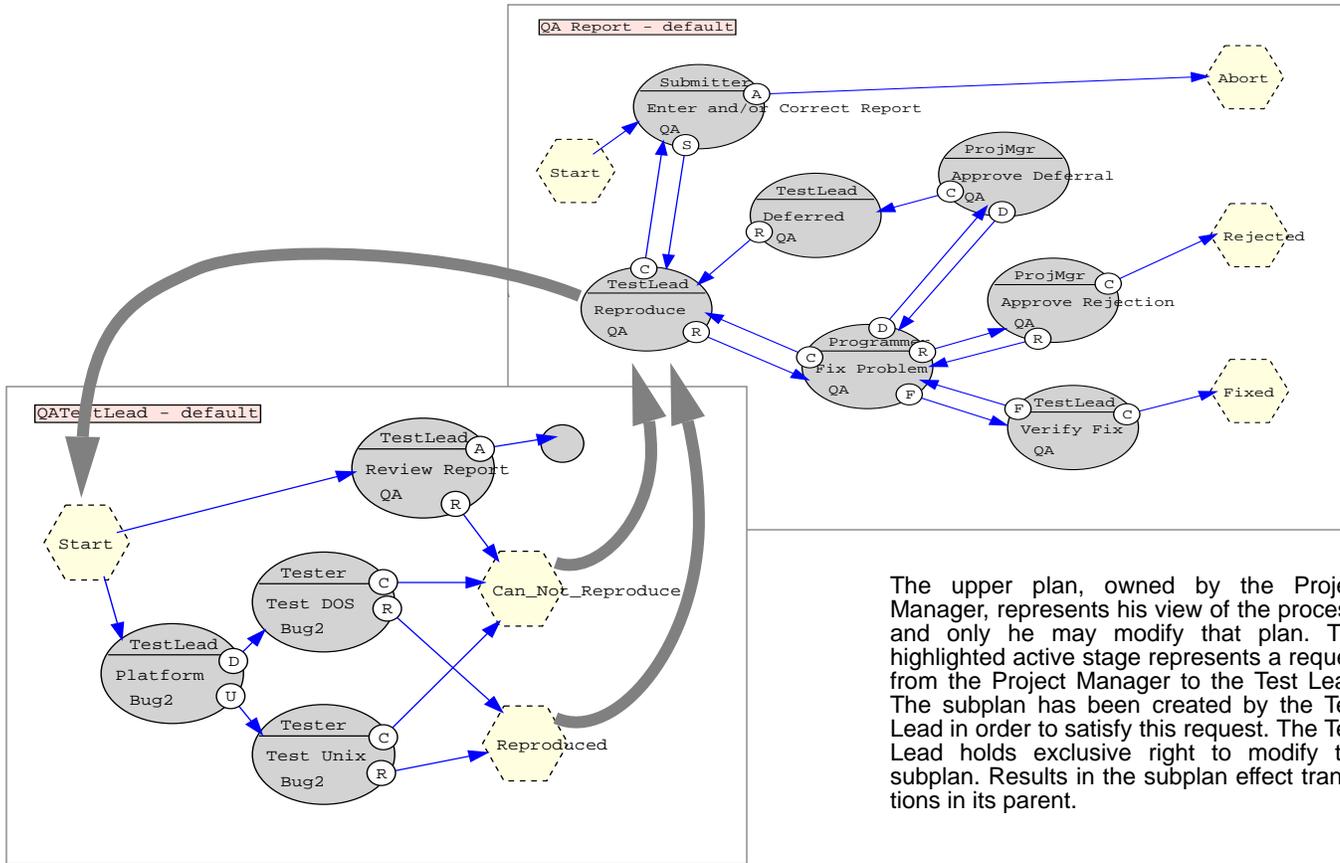

Figure 1.   The Bug Report Tracking Process

The upper plan, owned by the Project Manager, represents his view of the process, and only he may modify that plan. The highlighted active stage represents a request from the Project Manager to the Test Lead. The subplan has been created by the Test Lead in order to satisfy this request. The Test Lead holds exclusive right to modify the subplan. Results in the subplan effect transitions in its parent.

9.0   Conclusion & Summary

Business process reengineering is here to stay and will become increasingly important as a way for corporations to remain competitive. Process orientation combined with contributions from IT can yield tremendous performance improvements within companies. A program of continual improvement of processes is needed to assure the organization remains on top. Most process support tools work through centralized planning, but Collaborative Planning is the answer which empowers users to have control over their own processes, while integrating into the processes of their organization. CP has four basic requirements: end user programming, planning by multiple users, support for plan change, and different plans for different groups. There are benefits and drawbacks. Regatta Technology is an example of an existing CP tool which has been shown to be effective in a live environment. We expect that as the BPR movement gains momentum, the need for CP tools will become more clear, and more example will appear.

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