

Including Human Element in Change Models

Operationalizing the Concept of Commitment in Software Process Improvement Initiatives

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Abstract

This paper describes preliminary results from an ongoing study to construct an operational model of commitment based on the definition adopted by the software process improvement (SPI) community. By operationalizing the concept of commitment (one of the success requirements for a SPI initiative) in the shape of a model, a new insight is provided in improving software processes - a more human centered approach as opposed to various technical approaches available. In doing so the change agents are able to plan better the SPI initiative and the process developers are in a better position to benchmark successful projects (as well as failed ones). The paper argues that when the change agent explicitly demonstrates his/her commitment by his/her behavior or intended behavior (behaviors that were identified in successful organization development efforts by Porras & Hoffer (1986)) toward SPI-project and stakeholders involved within the project, this will have a positive effect on the outcome of the project. Results from five interviews with SPI professionals on the proposed Behavior-based Commitment Model are reported. Results suggest that the behaviors introduced in the model are relevant to SPI initiatives and the model could be used aside with CMM or other process improvement models.

Keywords: Software Process Improvement, commitment model, self-perception theory

BRT Keywords: DD01, AA01, AI0107

Introduction

It has been believed that successful software process improvement depends on the commitment to the project of both managerial levels and process users (Humphrey, 1989). Indeed, the importance of commitment has been emphasized in the software process community both in the literature (e.g. Grady, 1997; Humphrey, 1989) and in articles for example concerned with the risks that can impede SPI initiatives (e.g. Wieggers, 1998; Statz, Oxley & O'Toole, 1997).

This paper concentrates on reporting preliminary results from an ongoing study to construct an operational model of commitment (Behavior-based Commitment Model) based on the definition adopted by the software process improvement community. The model consists of two distinct parts: the questionnaire and the framework. The model assumes that the behavior affects the attitude rather than the opposite following the

guidelines proposed in self-perception theory explored briefly in the early part of the paper. The Behavior-based Commitment Questionnaire contains nine categories of behaviors identified by Porras and Hoffer (1986) having interviewed leaders in the organizational change field. These nine categories are further divided into individual behaviors. The framework is used to help the user of the model to interpret the results.

This paper suggests that behaviors, identified in successful organization development efforts by Porras & Hoffer, are relevant in software process improvement initiatives, and the explicit demonstration/consideration of these behaviors by the change agent will have a positive effect to the SPI-project's outcome. The Behavior-based Commitment Model was evaluated by conducting five semi-structured interviews with SPI professionals who all had a strong background in improving software processes. All professionals interviewed had a positive attitude toward the model proposed and were interested in testing the model in their projects.

This paper is organized so that it starts off by defining the concept of commitment and providing a brief view on the underlying theory. The following section introduces the construction of the Behavior-based Commitment Model and the results from the semi-structured interviews are presented at the very end. The paper is concluded with a summary and implications of the study to SPI field.

Background

Defining commitment

Brown (1996, 246) suggests that for research purposes, useful commitment measures must have a focus, they must specify terms, and they must include a sense of pledge or obligation. He clarifies this (*ibid.*, 233) by suggesting that all commitments, regardless of the context, share three common components: focus, terms and strength. All commitments have an object or focus – a party to which the commitment is made. Brown argues that terms are a fundamental part of any commitment since they state the conditions that will fulfill the commitment. Related to the terms, according to Brown, is the strength of a commitment, which will differ depending on the significance or importance in the life of the person who owns the commitment relative to other commitments.

In this paper the focus of commitment is a SPI-project with a clearly defined (as opposed to vaguely defined) and well understood goal(s). It has been well established in literature that when the goal is too vaguely defined or out of the individual's scope it becomes too abstract to consider (e.g. Robbins, 1993). Gilb (1988, 28) emphasized this point by stating that “projects without clear goals will not achieve their goals clearly”.

The terms that will fulfill the commitment in this paper are the behaviors that were identified to occur typically in successful organizational changes by Porras and Hoffer (1986) since it is commonly accepted that software process improvement will lead to organizational change. This view on commitment is in accordance with a view adopted by the SPI community mainly from Humphrey (1989). Humphrey (*ibid.*, 70) cites Salancik (1977) when he defines commitment as “a way to sustain action in the face of difficulties”. This view represents a ‘behavioral’ school of commitment research (as opposed to an ‘attitudinal’ school, see e.g. Brown (1996) or Mathieu & Zajac (1990) for details). According to this view, changes in the attitude are assumed to be the

consequences of changes in the behavior, rather than the reverse (Taylor 1994, 42). Becker (1960) introduced viewing commitment from a behavior-oriented point of view as he argued that commitment encompasses structural conditions that make a behavior irrevocable or difficult to change. Later Kiesler (1971) and Salancik (1977) continued exploring this approach.

Strength of a commitment varies depending on the factors fostering commitment. These factors are according to Salancik (1977) publicity, irrevocability, visibility and volitionally of the behavior demonstrated.

Therefore a definition of a measurable commitment that satisfies criteria proposed by Brown (1996) can be defined as a level to which a person explicitly demonstrates his/her commitment by his/her behavior or intended behavior toward SPI-project and stakeholders involved within the project. This definition is further explained by Salancik (1977) as he forms that “commitment is a state of being in which an individual becomes bound by his actions and through these actions to beliefs that sustain the activities and his own involvement”. Oliver (1990, 30) supports this view as he argues that “it is virtually impossible to describe commitment in any terms other than one’s inclination to act in a given way towards a particular commitment target”.

Underlying theory

The general class of theories in social psychology is known as consistency theories. These theories posit that when attitudes and behaviors are incongruent (within a single individual) the individual will alter either attitudes or behavior to make the two consistent (Menard & Huizinga, 1994). Bem’s (1967) self-perception theory asserts that attitudes are used to make sense out of an action (behavior) that has already occurred (Robbins, 1993). Attitude change therefore occurs after the behavior change. From this perspective, attitude is an effect rather than a cause of the behavior (Bem 1967). Attitudes are also private, nonexplicit, and retractable which, according to Salancik (1977), lessens the binding effect, which the behavior has on an individual. This theory supports the view on commitment proposed in the paper that when a behavior demonstrated by an individual is volitional, public, explicit and perhaps even nonretractable, the more committing it is and the attitudes will eventually change to be congruent with the behavior.

This paper does not claim that self-perception theory is the only theory underlying the Behavior-based Commitment Model but it provides a well-researched corner stone for the model to start with.

Having constructed the literary definition of commitment and introduced the underlying theory, the following chapters will concentrate on operationalizing this definition by introducing an instrument (Behavior-based Commitment Questionnaire) that can be used to capture the level of commitment. Finally a framework will be introduced (Behavior-based Commitment Framework) that allows to interpret the results.

Development of Behavior-based Commitment Model

Instrument to measure commitment

Porras and Hoffer (1986) argued that even though much has been written about need for a

change process to affect behavior relatively few studies have actually measured behavioral change. They identified common behavior changes in successful organization development effort by interviewing 41 leaders in the field of planned organizational change. It was further argued in the article that identifying a common set of behaviors could provide the basis for measurement instruments that could be used across organizations, thus facilitating the comparison of change efforts. They concluded that 40 out of 41 experts did agree that such common behaviors do exist and that even those who were more used to thinking of change in terms of changed values or beliefs had little trouble identifying typical behavior changes. As a result Porras and Hoffer categorized the behavior changes in all organizational levels to nine categories (later to be referred as the components of the framework) which are defined in Table 1.

Table 1: Common behavioral changes in successful organization development efforts: Category definitions (Porras & Hoffer, 1986, p. 485)

	Behavior category	Description
C1	Communicating openly	Behaviors promoting or reflecting the direct giving and receiving of information relevant to getting the job done.
C2	Collaborating	Behaviors promoting or reflecting the involvement of relevant persons in the processes of identifying and solving problems.
C3	Taking responsibility	Behaviors reflecting acceptance of responsibility and taking initiative in carrying out organizational tasks.
C4	Maintaining a shared vision	Behaviors reflecting a clear formulation, understanding, and commitment to organizational philosophy, values, and purposes and a commitment to high standards.
C5	Solving problems effectively	Behaviors reflecting a problem-solving orientation to difficult organizational issues.
C6	Respecting/supporting	Behaviors reflecting demonstration of respect and support for others as worthwhile individuals.
C7	Facilitating interactions	Behaviors reflecting attention to and use of human process issues in one-on-one, group, and intergroup situations.
C8	Inquiring	Behaviors reflecting a probing, inquiring, diagnostic orientation to the organization and its environment.
C9	Experimenting	Behaviors promoting or reflecting an openness to trying new things.

Each category shown in Table 1 is further divided to a set of behaviors that Porras and Hoffer identified from the interviews. An example of such division can be seen in Figure 1.

The object of the measurement instrument (Figure 1) is to measure to what extent the change agents (a person or a group of persons who are facilitating and/or responsible for the SPI initiative) are willing to demonstrate their commitment by taking these behaviors (by behavior category) into consideration in their software process improvement projects.

Figure 1: Behavior Based Commitment Questionnaire

To what extent do you plan to demonstrate the following behaviors in your upcoming SPI-project?

component (category) number	behavior category	scale				
		The behavior is relevant but do not intend to demonstrate it	I will demonstrate the behavior to some extent	I will demonstrate the behavior to high extent	I will demonstrate the behavior to full extent	The behavior is not relevant in the SPI-project
C3	Taking responsibility					
C3B1	Figuring out for oneself what is necessary to be effective in one's job and taking initiative for getting whatever information, cooperation, services, or materials are needed from relevant parties inside or outside of the organization.	0	1	2	3	-
C3B2	Asking for and taking responsibility and authority.	0	1	2	3	-
C3B3	Persisting in the struggle to make needed changes, especially in the face of frustration and ambiguity.	0	1	2	3	-
C3B4	Forming and offering more suggestions.	0	1	2	3	-
C3B5	Stating one's own contribution to a problematic situation rather than blaming others.	0	1	2	3	-
C3B6	Exhibiting behaviors that demonstrate movement along a continuum from monitoring one's own work to managing and prioritizing it to affecting the design of it to affecting its organizational context (e.g., policies and procedures) to affecting the goals and directions of the organization itself.	0	1	2	3	-
C3B7	Reflecting the responsibility in expressions of interest and excitement in the work.	0	1	2	3	-
C3B8	Reflecting the responsibility in decreased approval seeking, face saving, indifference, burnout, or "coasting".	0	1	2	3	-

General formula → $Cx \% \text{ part} = ((CxB1 + \dots + CxBn) / n * 3) * 100$

Applying values shown in the example above → $C3 \% \text{ part} = ((C3B1 + C3B2 + C3B3 + C3B4 + C3B5 + C3B6 + C3B7 + C3B8) / (n * 3)) * 100\%$
 $= ((3 + 1 + 2 + 1 + 0 + 1 + 3 + 1) / (8 * 3)) * 100 = (12 / 24) * 100\%$
 $= 50.0\%$ ← Value for the C3 that can be ticked to the framework

The Behavior-based Commitment Questionnaire consists of the behavior category number (C3 in Figure 1), the behavior category name ('Taking responsibility' in Figure 1) and a set of behaviors that form the category (8 behaviors in Figure 1). Each behavior is evaluated by a change agent as to what extent the particular change agent will demonstrate the behavior under consideration. The scale consists of five points:

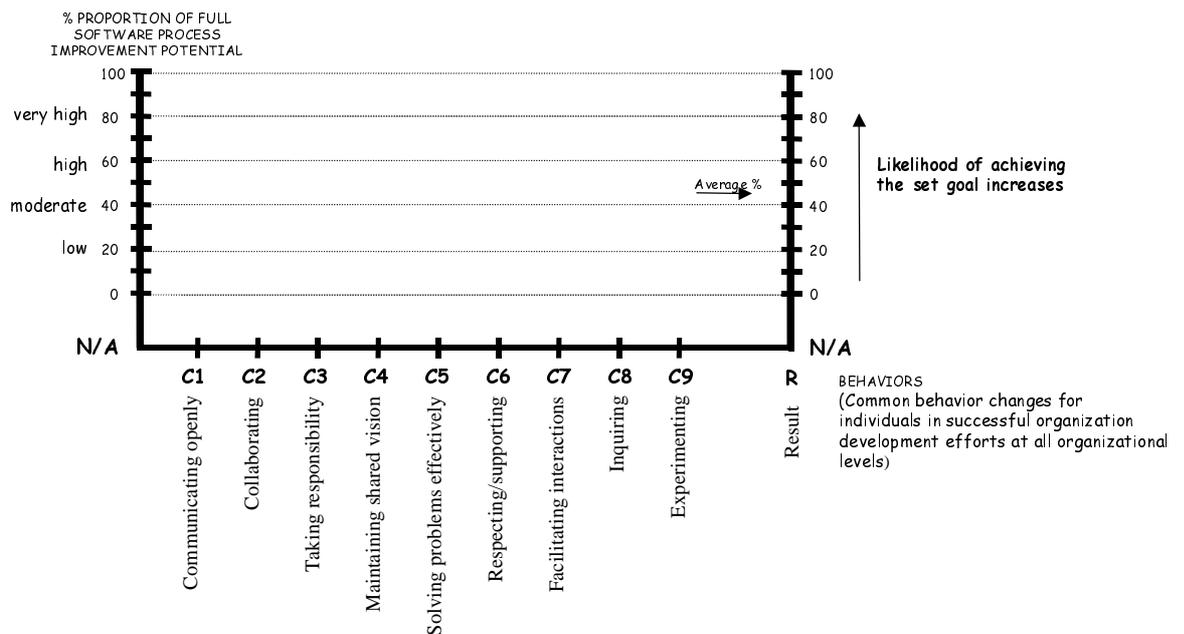
- a) the change agent views the behavior to be relevant, but has no intention to demonstrate it,
- b) the change agent will demonstrate the behavior to some extent,
- c) the change agent will demonstrate the behavior to high extent,
- d) the change agent will demonstrate the behavior to full extent, and
- e) the behavior is not relevant (or N/A not applicable) to the SPI-project under evaluation.

The value for the behavior category (introduced as a component in the Behavior-based Commitment Framework in Figure 2) is calculated (example shown in the bottom part of Figure 1) by the formula $((CxB1 + \dots + CxBn) / n * 3) * 100$, where Cx is the component to be calculated, B1 the first behavior, Bn the last behavior in each category and n is the number of behaviors included in the category (excluding those that were selected as non-relevant to the SPI initiative under evaluation). The overall value (component R in Figure 2) over all categories will be calculated by formula $((C1B1 + \dots + C1Bn) + \dots + (C9B1 + \dots + C9Bn)) / (C1n + \dots + C9n) * 3 * 100$. The overall value represents the proportion in percentage of the full potential that will be used to implement software process improvement initiative.

Framework for interpreting results

The purpose of the framework is to provide a platform for interpreting the results obtained from filling out the questionnaire shown in Figure 1 (note that the questionnaire has nine parts, one for each behavior category). The Behavior-based Commitment Framework (Figure 2) consists of nine behavior categories (defined in Table 1, represented in Figure 2 as components C1...C9) and the explaining factor as an answer to what the result indicates in relation to the SPI-project.

Figure 2: Behavior Based Commitment Framework



The framework suggests (at this state) that all behavior categories and behaviors in those categories are equally evaluated. The author does not claim that though. There is not enough sufficient evidence to weigh certain behaviors over others until the results from the field experiments are thoroughly explored and evaluated.

The underlying hypothesis of the Behavior-based Commitment Model (the questionnaire and the framework together) can be formulated as follows:

1. Behavior changes proposed by Porras and Hoffer (1986) are relevant also in SPI initiatives and
2. the demonstration of these behaviors will effect positively the outcome of the SPI-project.

Applying Behavior-based Commitment Model in practice

When applying the model in practice problems could arise if one takes these behaviors too literally, without considering their context and the underlying values they represent and reflect. In an extreme case, attempting to manipulate individuals to behave in a way identified by the model could arrest individual growth and, in the long run at least, harm the organizational performance as well. (Porras & Hoffer 1986, 490)

The purpose of the behavior-based model is to serve as a medium for designing

and carrying through the SPI initiative, and after the project to serve as a diagnostic tool to identify characteristics of a successful/unsuccessful SPI-project.

It is suggested that the SPI-manager fills out the 9-part questionnaire before initiating the SPI-project, calculates the results and uses these results as a basis for a discussion forum with other SPI-managers, SPI-staff and/or process users (people who actually implement the change). When the scores are analyzed, one should keep in mind that none of the scores are absolute values but rather rough sketches that helps to put the person (or a group) who applies the model to the map. If for example the SPI-manager ranks all behaviors equally high, he/she indicates that all (high scoring) behaviors are going to demonstrated in a highly visible manner.

After the SPI-project or for example every six months process users either as individuals (results are calculated using average values) or as a group fills out the Behavior-based Commitment Questionnaire (Figure 1, wording of the question and the scale should be modified to correspond the situation). In this latter situation the purpose is to identify to what extent the process users feel that these behaviors are demonstrated in the SPI-project. The results could be used to benchmark the SPI-projects. This should be the place where the SPI-manager can see whether his/her plan of demonstrating the behaviors actually succeeded.

This paper suggests that the use of the Behavior-based Commitment Model raises the awareness of the change agents applying the model as to what are the positive behaviors that they should consider. Skilling (1996) clarifies this by pointing out that “if one wants to see others change, change one’s self”. Demonstrating new, changed behavior works as an indicator to others of the change process’ results. By raising the awareness the model brings the human perspective closer to the software process improvement initiatives and works as a forum for discussion and a signal between various stakeholders involved in the project.

Views from the field – SPI professionals’ opinions

The Behavior-based Commitment Model was preliminary evaluated by conducting five semi-structured interviews. All persons interviewed had a strong experience in leading several software process improvement projects. The purpose of the interview was to find out a) whether the Behavior-based Commitment Model is relevant to the SPI projects, b) where could the model possibly be used, and c) how willing are the professionals to try out the model in practice.

Relevancy of proposed behavior categories

The interviewees were asked whether they felt that the components proposed in the model were relevant also in a SPI project. Extracts from the interviews are presented below.

“My first impression is that all behavior categories are important...”

C1 - Open communication

“Communication is extremely important since we do not give or take orders. We meet and the team decides what we are going to do. I supervise and coach them, I don’t give orders to them or make decisions for them...”

C2 - Collaboration

“Naturally I need people who are capable working by themselves...We have to be able to co-operate when we meet...”

C3 - Taking responsibility

“Taking responsibility is important also since you cannot expect someone to take over for you...They have to be able to say that this is important to us and that is the reason we did it...Then they have taken responsibility.”

“...It is important because nothing happens by itself, somebody has to take the responsibility and ‘burn’ for it...”

C4 - Maintaining a shared vision

“Yes, important as well. We have to share the same vision but we can not keep to ourselves. You have to sell it. You have to tell a story, sell the vision to them who do not have it... If you are quality engineer you have to work closely with your project manager and slowly get him to see things the same way you do...make him/her able to see the possibilities...”

“This is important because the area where we are in is unclear and if we do not talk and know where is the leading star, people start running in different directions.”

C5 - Solving problems effectively

“You can’t keep the problems to yourself. It is important if they do something to solve the problem. If the problem is out of our reach, we still can work on it...we may not be able to solve it, but we can still be aware of it...Same goes to problems related to people issues...you can’t pretend that they would not exist.”

C6 - Respect/support

“I’d like to be respected...We have to support us as a team and we have to show it...It is also part of forming a team from a group of people...You are important to the project and to me...that is how it should come out. You should not fake the respect, and if you still keep doing it, it will lose its’ value...You have to be able to define a role for a person in which he/she can be important in...It is clear than more experienced person brings more to the project than a junior but still they both have to feel their presence important...”

“...when people get into situation they have not been in before, they feel uncomfortable...they have to be supported...”

C7 - Facilitating interactions

“It is part of my job. Rotating the chairperson role in the meetings...I would like that...This is a culture dependant matter...”

C8 - Inquiring

“These people should dig out information...it is not enough to have a description of what we do...We have to have a larger view of the data that only plain numbers...If you see something peculiar, you should find out the reason...”

C9 - Experimenting

“...we are going to make mistakes. If you are not prepared for it, you’ll be disappointed...‘Accepting mistakes’, ‘rewarding good tries’, even though one trial is a mistake, it still means something...we have to leave room for evaluation and experimenting...even though certain model does not seem to fit, you still have to be able

to try it out...They should not ask first but should be able to act, take responsibility and make an experiment...”

All behavior categories were estimated to be at least moderately relevant also in SPI-projects. Categories ‘Open communication’ and ‘Taking responsibility’ were ranked as the highest in relevancy and ‘Solving problems effectively’ was ranked as the lowest.

Usage possibilities for the Behavior-based Commitment Model

The professionals were asked how they viewed that Behavior-based Commitment model could be used. Extracts from the interviews are presented below.

“...It may not be the whole truth but the world is so complex...maybe as a roadmap like CMM.”

“Yes. This makes sense...This could be used aside with CMM to support it...”

“...you can get some necessary information because this (Behavior-based Commitment Model) is divided into components...”

“First idea that came to me is that this could be used to evaluate whether an organization is ready for change...or to decide what we should do before we make a move to certain direction...I would not use this a checklist because the things they tell me – their attitude, body language... I would use this as a baseline for discussion with change agents to find out where we are going.”

“...this is a kind of tool for them (change agents), help them to understand what they should consider...They do not have too many tools for doing that...”

“The usage of this model already shows that we are ready for this project...It helps bringing people together...”

“It can be said that here is all you need to do. If you do not have this (Behavior-based Commitment Questionnaire) in hand, you would remember only 5% from it. With the paper you would remember 25%...The advantage of this (Behavior-based Commitment Model) is that it gives you focus, and could work as a discussion forum...This sounds to me very valuable.”

”...it could be used as a checklist to see if we have covered all the angles. If we say somewhere that ‘no’ or N/A (not applicable)[for certain behavior] then we should have a good reason for doing so...”

Professionals viewed several potential usage possibilities for the Behavior-based Commitment Model (see Table 2 for summary). A clear benefit from the interviews was the fact that all interviewees tried to put the model into their situation, which provided new insights that would have not been discovered otherwise. Some of the professionals also argued that:

“The quality of a model depends on how it is being applied more than the model itself.”

”All models are bad, some are just more applicable than others.”

This indicates that there are many models ‘out there’ and the term ‘model’ itself has suffered some sort of inflation. Still, despite the skepticism, the professionals agreed that the Behavior-based Commitment Model could be used aside with another more

technical approach (e.g. CMM, Capability Maturity Model developed by Software Engineering Institute, see Paulk et al. (1995) for details).

Table 2: Behavior-based Commitment Model – usage possibilities

User	Purpose	Goal is to...
Change agent	Plan the SPI-initiative as to which behaviors are to be considered and to what extent. Use the model as a self-report scale during/after the project to evaluate which behaviors were actually demonstrated.	raise awareness. be a reminder; serve as a checkpoint.
Process users	Evaluate how well the process users acknowledged these behaviors during the project.	serve as a discussion forum; diagnose/benchmark successful/unsuccessful projects.
Managerial levels	Evaluate how well the organization from their point of view as a whole acknowledges behaviors pointed out in the model.	raise awareness; serve as a discussion forum and a signal between various stakeholders.

Willingness to try out the model in practice

The professionals were asked if they would be interested in using and developing the model further. Extracts from the interviews are presented below.

“I would see that this could be used...It would be interesting to try this out to certain people – people that are working within the same subject matter as I am...I would like to see what they think...”

”Yes, in fact, I was just thinking that if you would...specify these behaviors...it would really interest me...this (Behavior-based Commitment Model) interests us in team level.”

“...this (Behavior-based Commitment Model) should be developed further...we would like to provide play ground for you...”

The model proved to be intuitively appealing to the professionals as they all agreed to try out the model in practice. This was seen to be an encouraging result from the interview. The results from the interviews suggest that the model brings extra value to implementing SPI initiatives since professionals thought that the human perspective is rather poorly included in current process improvement models.

Conclusion

This paper described preliminary results from an ongoing study to construct an operational model of commitment (Behavior-based Commitment Model) based on the definition adopted by the software process improvement community. The model along the underlying theory and the operationalized definition was introduced with suggestions on how and where to utilize it.

It was suggested in the paper that by definition, in the software process improvement field, the behaviors are thought to affect the attitudes of an individual. The supporting theory is Bem’s (1967) self-perception theory that argues that attitude change

occurs after the behavior change rather than the reverse. The paper argued further that demonstrating behaviors that are identified in successful organizational changes would have a positive effect on the outcome of the project.

Five SPI professionals were interviewed to evaluate the model proposed. Professionals agreed on the relevancy of the behavior categories proposed by Porras and Hoffer (1986) in the SPI projects, which supports the first hypothesis proposed in the paper. The second hypothesis, whether the use of the model by a change agent will indeed have a positive effect to the outcome of the project, needs to be proven. The Behavior-based Commitment Model has been introduced (after the interviews reported in this paper) to various organizations and their process improvement specialists. It has been currently applied in practice in 14 software process improvement initiatives. Results in near future will show what are the benefits and challenges of the actual model usage.

Positive feedback received from the professionals in the interviews demonstrated that there is a need in the SPI community to include the human element in the models that guide the improvement process. This is not to say that only human elements are important but to emphasize its meaning in the long run SPI field needs to gain better understanding of such complex processes as motivating and committing people to organizational change.

There are several limitations to this study that should be noted. When analyzing the results from the interviews it should be pointed out that the interviewees were introduced the model with little or no time to investigate them thoroughly. After the brief introduction they were asked to respond to the questions concerning various themes about the model. In research guides it is generally warned that this kind of artificial situation might lead to a point where the interviewees answer as they think the researcher would like them to answer. In this case all professionals volunteered to participate in this study by themselves and the interviews were held in natural settings with a relaxed and open atmosphere. The evidence of such is the open critique that was received and on the other hand the willingness to try the model out. Another limitation to the study is the number of interviews conducted which does not allow the author to generalize the results. Goffin & Szwejczewski (1996) studied management commitment to quality and introduced preliminary findings based on only six interviews with management in different factories. This supports the method used in this paper to report the preliminary results.

Little research has been conducted in this area of study in the software process improvement field. This research opens views on commitment that have not been explored in software process improvement literature before and by doing this will provide a starting point to a discussion forum for the research specialists also. Future research should clearly focus on identifying recurring behavior patterns that are associated with successful or failing process improvement initiatives. These behavior patterns could be identified as behavior repertoires or behavior pools. A solid starting point for identifying such is the Behavior-based Commitment Model proposed in the paper. Questions that the researchers exploring this matter further should ask themselves are:

- 1) Are we covering all the relevant aspects (are there any only process improvement dependant behaviors?),
- 2) which are the irrelevant behaviors that should be excluded, and
- 3) does the resulting score indicate commitment to the project or 'only' characteristics of the project.

This paper brings new insight on viewing commitment not only as a psychological state but also as an operational tool that will help change agents to plan better their improvement projects.

References

- Bem, D. J. 1967. Self-perception: An alternative interpretation of cognitive dissonance phenomena. *Psychological Review*, Vol. 74, pp. 183-200.
- Brown, R. B. 1996. Organizational commitment: clarifying the concept and simplifying the existing construct typology, in *Journal of Vocational Behavior*, Vol. 49, 230-251.
- Gilb, T. 1988. *Principles of Software Engineering Management*, Wokingham, Addison-Wesley.
- Goffin, K., & Szwejczewski, M. 1996. Is management commitment to quality just "a given"? *The TQM Magazine*, Vol. 8, No. 2, pp. 26-31.
- Grady, R. B. 1997. *Successful Software Process Improvement*. Prentice-Hall, NJ.
- Humphrey, W. S. 1989. *Managing the Software Process*. Addison-Wesley
- Kiesler C., A. 1971. *The Psychology of Commitment: Experiments Linking Behavior to Liking*, Academic Press
- Mathieu, J. E., & Zajac, D. M. 1990. A review and meta-analysis of the antecedents, correlates, and consequences of organizational commitment. *Psychological Bulletin*, Vol. 108, pp. 171-194.
- Menard, S., & Huizinga, D. 1994. Changes in conventional attitudes and delinquent behavior in adolescence. *Youth & Society*, Vol. 26, No. 1, pp. 23-52.
- Oliver, N. 1990. Rewards, investments, alternatives and organizational commitment: Empirical evidence and theoretical development. *The British Psychological Society*, Vol. 63, pp. 19-31.
- Paulk, C. M., et al. 1995. *The Capability Maturity Model: Guidelines for Improving the Software Process*, Carnegie Mellon University, Software Engineering Institute, Addison-Wesley.
- Porras, J. I., Hoffer, S. J. 1986. Common behavior changes in successful organization development efforts. *Journal of Applied Behavioral Science*, Vol. 22, pp. 477- 494.
- Robbins, S. P. 1993. *Organizational Behavior*. Prentice-Hall, Englewood Cliffs, New Jersey, 6. ed.
- Salancik G. R. 1977. Commitment is too Easy! In Tushman M & Moore W. (eds.), *Readings in the Management of Innovation*, pp.207-222. Boston: Pitman 1982
- Skilling, D. 1996. Beyond the quick fix: how to manage more effectively in the heart of change. *Industrial & Commercial Training*, Vol. 28, No. 4, pp. 3-7.
- Statz, J., Oxley, D., & O'Toole, P. 1997. Identifying and Managing Risks for Software Process Improvement, *CrossTalk*, April, <http://www.stsc.hill.af.mil/CrossTalk/1997/apr/Identifying.html>
- Taylor, W. A. 1994. Senior executives and ISO 9000 – Attitudes, behaviours and commitment. *International Journal of Quality and Reliability Management*. Vol. 12, No. 4, pp. 40-57.
- Wieggers, K. E. 1998. Software Process Improvement: Eight Traps to Avoid. *CrossTalk*, The Journal of Defense Software Engineering. September.