7 AN INTEGRAL APPROACH TO INFORMATION TECHNOLOGY DIFFUSION: Innovation in the Product Life Cycles of a Large Technology Company

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Abstract   *A practitioner in a large technology company reflects on a successfully designed and implemented enterprise-wide IT diffusion, which exemplifies both integral and action research approaches. An online tool, in use in one part of the company, was modified and extended to support a standard and customizable product life cycle methodology. In addition, this diffusion approach addressed the broader system of work, including culture and the intentions and behaviors of organization members. Other lessons learned are captured as key success factors, change agent attributes, and useful research methods.*

Keywords   Integral, diffusion, action research, product life cycle, culture change, Sun Microsystems

1   INTRODUCTION

This practitioner's report describes how a team of five change agents successfully diffused a product life cycle (PLC) in a large technology company.

Diffusing IT in large human systems is a risky proposition. IT solutions commonly fail to be accepted, or are used in ways that prevent full realization of possible benefits (for an example, see Ginn 1993). Contributing factors to such failures include an emphasis on technical solutions at the expense of cultural factors, and stock solutions that are implemented without modification or in inappropriate settings or situations.

Therefore, my intent in this report is neither to champion adoption of formalized and unified PLCs, nor to provide the technical details of our solution, nor even to

trumpet a series of steps that will ensure diffusion success. Rather, my intention is to communicate the world as it appeared to us as we acted: what we were seeing, our motivations and hopes, choices we made and the reasoning behind them, what we think worked and why. My expectation is that this reflective reporting approach will contribute to improved diffusion success and a deepening of the theoretical basis of our work.

In this report I will briefly describe the organizational context of the diffusion project. I will then explore key success factors including change agent characteristics. Finally I'll describe my epistemologies and research methods.

2   ORGANIZATIONAL CONTEXT

In 2000, Sun Microsystems had 40,000 employees and $15 billion annual revenue mostly from server and other computing hardware sales. The company was an industry leader in innovative software (e.g., Solaris, Java), and had a dynamic CEO with a compelling vision: "The network is the computer."

Growing demand from new markets such as online services, web presencing, and digital telecom drove revenue growth, but also diverted attention from emerging issues of Sun's traditional customer base. Rapid growth was diminishing Sun's capacity to focus on the increasing complexity of new products and changing needs of their core customers. Addressing this weakness was the compelling business case for a renewed focus on PLC processes, and for a new organizational capacity to work across professional domains and business units.

At the time, a half-dozen PLCs within Sun were recognized as significant and unique standards. These various PLCs reflected post-reorganization digressions from a core hardware engineering standard, contrasting cultures of product development as seen in the formal Solaris and entrepreneurial Java software groups, or simply cultural differences between engineering and operations groups.

We foresaw significant challenges of developing and standardizing a PLC, including

- Cultural differences and even animosities
- Fear of increased bureaucracy and diminished autonomy
- Only a few narrowly adopted online tools with modest robustness
- Resources from the corporate IT group would likely not be forthcoming
- Senior management did not yet see that a single enterprise-wide PLC would address Sun's strategic business issues

However daunting these challenges, we judged that the benefits of adopting a more formal and unified PLC would far outweigh the difficulties of implementation. For example, we anticipated that group cultural differences could be confronted and resolved in service of a project that would clearly benefit Sun. We were convinced that without our PLC diffusion project requiring it, the critical cross-product coordination required to address our market challenges could not happen.

Three years later the project was completed and appeared to be successful on several levels. Sun had a single PLC and its work methods and online tools were clearly

in use. The PLC had entered the everyday conversations of the company—it was not uncommon to hear people remarking on how it impacted the product on which they were working. Customization and other design choices had mitigated potential drawbacks; a PLC "process" emphasis was seen as balanced and supporting business results. Senior executives demonstrated their support with development funds, statements of personal support, and communication to media and analysts that a focus on PLCs was part of the company's plan to recover from the "dot.com collapse."

There were several significant efforts underway to resolve the remaining technical, process, and cultural "snags" that remained as barriers to getting the most value from the new unified PLC. Also, Sun's software organizations were finally able to successfully resolve a customer imperative that was given high priority by the CEO a decade earlier: to integrate all of Sun's software into a single integrated and tested quarterly release.

3   THE FOCUS OF OUR DIFFUSION EFFORT

On the surface we were trying to "install" a formally documented model that would guide the management of products from conception to retirement. The term *product life cycle* usually refers to this model and its expression in the social structures of an organization, including published guidelines of use, associated training, scheduled reviews where specific decisions are made, and the information technologies used to support its use.

We also intended to address the emotional and interpersonal capacities of the individuals who participated in the PLC's product reviews. A critical diffusion outcome was enhancing their ability to relate to and work with coworkers from different professional domains (e.g., engineering, marketing, operations) who often had different business unit loyalties. We did this by introducing language that accommodated the wide range of customs and cultures, as suggested by spiral dynamics (Beck and Cowan 1996), a developmental model of values. We also introduced formalized product reviews using facilitated, experiential role playing in workshops.

4   KEY SUCCESS FACTORS

The five change agents who conceived, created, and assisted this diffusion project would conclude that the following were key success factors for the diffusion project:

- The team members were able to secure management support to spend 50 percent of their time on this cross-enterprise effort for the several years needed to complete the project.

- An early design decision was made to build upon existing work processes and their supporting technologies whenever possible.

- Parallel emphasis on quality by Sun and the creation of a new position of Vice President of Quality, who was enrolled to sponsor our work.

- A coincidental effort to adopt GE's quality methods (six sigma) and the associated emphasis and training on organizational change to support improved business results.

- Successful use of organizational mechanisms that historically have been effective in enabling cross-functional and cross-organizational work (for example, the establishment of an executive steering committee).

- The strategic business challenges that made our work important and enhanced our ability to compellingly communicate that message.

- Outstanding reviews of our introductory training, validating our decision to outsource its design and delivery.

- Agreement by the manager of an existing online tool to expand its scope to include all of Sun's business units rather than just his own.

5   CHARACTERISTICS OF CHANGE AGENTS

Five process-oriented individual contributors from various business units and domains of work (e.g., hardware, software, operations) became committed to unifying, weaving together Sun's practices for managing products "cradle to grave." This was something that was ambitious yet realistic given their backgrounds and skills, which included

- Familiarity with the various in-use product life cycle models at Sun
- Stature in their various business units and professional domains
- Ability to conceive of work and contribution based on external strategic issues in addition to internal efficiency and political (personal) issues
- Ability to incorporate cultural and human factors into the design of an information technology or service
- A world view that could include an enterprise-wide span of business units, product types, and cultures—and a multiyear project time line
- A bias for the values and methods of action research (Bentz and Shapiro 1998; Torbert et al. 2004)
- Familiarity with the capability maturity model[1] and its SCAMPI assessment method,[2] as well as other process models and assessment methods

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[1]*What Is the CMMI?*, Software Engineering Institute, Carnegie Mellon University, http://www.sei.cmu.edu/cmmi/general/general.htmll.

[2]*Standard CMMI® Appraisal Method for Process Improvement (SCAMPI^SM), Version 1.1: Method Definition Document*, Software Engineering Institute, Carnegie Mellon University, http://www.sei.cmu.edu/publications/documents/01.reports/ 01hb001.html.

- Familiarity with the Software Engineering Institute's approach to managing technological change[3] and working with change agents and sponsors,[4] as well as other approaches to organization development and change management

6 REFLECTIONS ON EPISTEMOLOGIES AND RESEARCH METHODS

My conclusions from this diffusion are that action research is a useful approach, that addressing multiple perspectives supports project success, and that both practitioners and the field of technology diffusion are well served by reflective practitioner reports.

6.1 Using Action Research to Successfully Diffuse an Information Technology

In this diffusion project we adopted the intentions, values, and steps of action research (Bentz and Shapiro 1998). Doing so contributed greatly to our success.

We followed steps typical of action research:

- Identify a problem on which to take action
- State a goal and procedure for attaining it
- Record actions taken and progress made toward the goal
- Infer generalizations between actions and progress toward the goal
- Continually test the generalizations (some of which are reported above as key success factors)

As change agents embracing action research, our intention was to change a system while providing opportunities for development and self-determination for members of impacted systems. We created occasions for learning and participation in data collection, analysis, and decision making for those who managed, used, or were impacted by the new PLC. This helped them adapt to the stresses of change, implement effectively, and grow their capacities to design, manage, and improve new systems of work in the future.

We also deliberately created occasions for our own learning. For example, we created feedback loops by early piloting of various parts of the PLC, attempted to use the PLC ourselves, and continually tested marketing messages.

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[3]*Managing Technological Change*, Software Engineering Institute, Carnegie Mellon University, http://www.sei.cmu.edu/products/courses/mtc.html.

[4]*Consulting Skills Workshop*, Software Engineering Institute, Carnegie Mellon University, http://www.sei.cmu.edu/products/courses/cons.skills.wkshop.html.

6.2 The Value of Multiple Perspectives
in Action Research

Action research is unique among cultures of inquiry in that is grounded more in intentions and values than in a particular epistemology (Bentz and Shapiro 1998). Borrowing epistemological perspectives and methodologies as appropriate can be a strength when done with informed awareness. To support the success of our diffusion project we chose to integrate four distinct perspectives, based on the integral methodological pluralism of American philosopher Ken Wilber:[5]

- Counting observable behaviors
- Acknowledging individual's inner concerns, motivations, and experience
- Establishing a "systems thinking" understanding of how things fit together and influence each other
- Being responsible for cultural differences and the inherently subjective nature of many customs, habits, and views of how the world should work

The first two of these perspectives are well represented by the natural and human sciences as described by van Manen (1990). For example, Wilhelm Dilthey (1987) distinguished between the *Naturwissenschaften* or a natural science of things and the *Geisteswissenschaften*, which we might call a human science that addresses thoughts, values, feelings, emotions, and beliefs.

A natural science addresses objects of nature and how they behave, while a human science addresses beings that have consciousness and whose purposeful actions and making of meanings are expressions of what it is to be human in the world.

Natural and human sciences are consistent with an integral methodological pluralism, although insufficient by themselves. An excellent treatment of the perspectives taken by natural and human scientists and how they can be complemented by postmodern and other perspectives is seen in Wilber's (2001) integral theory.[6]

6.3 Action Research and Reflective Writing

Reflective writing has a rich history as a research method. Reflective writing, along with human science, was part of a hermeneutic phenomenological culture of inquiry found as traditions in Germany from 1900 to 1965 and in the Netherlands from 1945 to 1970 (van Manen 1990). Sartre (1956) even suggested that writing is the primary method of research. By writing, reflecting, and rewriting one can develop a depth that does justice to the fullness and ambiguity of lived experience.

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[5]*Excerpt A: An Integral Age at the Leading Edge*, http://wilber.shambhala.com/html/books/kosmos/excerptA/intro.cfm/.

[6]See also Wilber's *Excerpt B: The Many Ways We Touch*, http://wilber.shambhala.com/html/books/kosmos/ excerptB/intro.cfm, and *Excerpt C: The Ways We Are in This Together*, http://wilber. shambhala.com/html/books/kosmos/excerptC/intro-1.cfm/.

For me, part of the value of this practitioner report is as a structure to write reflectively. I'm finding that, as Merleau-Ponty (1973, p. 142) said, "When I speak I discover what it is that I wished to say."

7 SUMMARY

Five change agents enhanced their company's resiliency and ability to respond to strategic business issues by diffusing an enterprise-wide PLC. We found that integral and action research approaches to diffusion supported our success.

Aspects of the diffusion project most promising for adoption by practitioners are:

- Designing and implementing diffusion projects using as many perspectives as possible
- Developing yourself as a capable change agent—I continue to do this using the integral practice frameworks of Leonard and Murphy (1995) and Wilber (2006)
- Finding and partnering with other change agents
- Using action research as a method to involve everyone in learning and implementation
- Writing practitioner reports for each of your big projects

Further explorations of integral approaches to business can be engaged at the business and leadership domain of Integral University (http://integraluniversity.org). Another promising line of research into integral perspectives and leadership is being conducted by Pauchant (2006).

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