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The Role of Frontline Leadership in Organizational Learning: Evidence from Incremental Business Process Improvement

Isabelle Nathalie Monlouis

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The author of this dissertation is:

Isabelle Nathalie Monlouis
4167 d'Youville Trace
Atlanta, Georgia 30341

The director of this dissertation is:

Dr. Daniel Robey, PhD
Computer Information Systems
Robinson College of Business
35 Broad St.
Atlanta, GA
Ninth Floor

The Role of Frontline Leadership in Organizational Learning: Evidence from Incremental Business Process Improvement

BY

Isabelle Nathalie Monlouis

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ACCEPTANCE

This dissertation was prepared under the direction of the *Isabelle Nathalie Monlouis* Dissertation Committee. It has been approved and accepted by all members of that committee, and it has been accepted in partial fulfillment of the requirements for the degree of Doctoral of Philosophy in Business Administration in the J. Mack Robinson College of Business of Georgia State University.

H. Fenwick Huss, Dean

DISSERTATION COMMITTEE

Dr. Dan Robey (Chair)

Dr. Lars Mathiassen

Dr. Adrian Souw-Chin Choo

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This narrative moved from the “I” to the “we” voice, because it is hard to report research findings without acknowledging all the support I have received along the way. Even when the support masqueraded as requests for speed or as challenges to the research topic. Every event and how it unfolded contributed to this dissertation.

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I’m still learning.
Isabelle

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LIST OF ABBREVIATIONS

BB – Black Belt

CPG – Consumer Product Goods International (pseudonym for research setting)

DMAIC – Define, Measure, Analyze, Improve, Control

GB – Green Belt

iBPI – incremental business process improvement

MBB – Master Black Belt

ABSTRACT

THE ROLE OF FRONTLINE LEADERSHIP IN ORGANIZATIONAL LEARNING: EVIDENCE FROM INCREMENTAL BUSINESS PROCESS IMPROVEMENT

BY

ISABELLE NATHALIE MONLOUIS

2013

Committee Chair: *Dr Daniel Robey, PhD*

Major Academic Unit: *Business Administration*

What is the role of frontline project leadership in organizational learning in incremental business process improvement (iBPI)? Current literature is sparse on the topic of contributions to organizational learning made by frontline employees leading iBPI projects. To bridge this gap, we use an embedded longitudinal multiple case to study the process of leadership of four frontline iBPI projects. The 4I model (intuiting, interpreting, integrating, and institutionalizing) of organizational learning serves as a theoretical lens to study how the insights originating from frontline employees unfold through group-level integration and organization-level institutionalization.

Mapping the flow of key project events to the relevant social and psychological processes of the 4I model, we identify how organizational learning unfolds within and through the three levels of the model. The granularity of the 4I model creates a valuable foundation for informing the role of frontline project leadership in iBPI programs and the capacity to leverage insights originating from frontline employees into organizational learning. Practitioners and engaged

scholars will find this level of granularity helpful for program design, evaluation, and learning interventions.

INTRODUCTION

I.I Research Domain

Six Sigma was developed in the 1980's and promoted by Motorola as a business management strategy to improve quality, reduce costs, increase employee engagement, and position a company to exceed customer expectations. Use of Six Sigma for organizational effectiveness expanded dramatically when General Electric (GE) endorsed Six Sigma as a strategy to drive business transformation and sustain competitive advantage. Through process re-engineering, leadership development, and organizational learning as its main drivers, GE reported $2 billion in savings (GE 1999 annual report). By 2007, 50% of Fortune 500 companies and 82% of Fortune 100 companies had adopted a version of Six Sigma (Marx, 2007), yet they reported mixed results.

In August 2009, CPG North America, a subsidiary of a consumer goods Fortune 500 company, launched its Six Sigma program to decrease costs and position itself for strategic growth. Increases in productivity were necessary to generate the cash flow required to finance a $20-billion acquisition and to invest in growing sales of their market-dominant brands. With a company split between a high-growth, multi-billion-dollar business and a high-margin, multi-billion-dollar business needed to fuel the growth, the demand for sustained performance grew higher.

With these high stakes, the focus of Six Sigma practice at CPG has been on strategy, technical toolkit, selection, and development of full-time Black Belts and Master Black Belts, "heavyweight project leaders" (Schroeder et al., 2008) who implement large Six Sigma projects. They provide proof of concept and early financial results necessary to rally program support.

However, focus on full-time project leaders alone may not be sufficient to deliver on the promises of the Six Sigma program as a sustainable engine of organizational effectiveness and cultural change. Less is understood about Green Belt program deployments. While Black Belts and Master Black Belts typically represent less than 1% of the workforce, Green Belts who are part-time project leaders typically represent 10% to 50% of the employee base, providing critical leverage. As embedded resources, Green Belts provide cultural leverage through their numbers and their existing networks of relationships.

My interest in this domain grew out of experiences working as a consultant for CPG North America, which was undertaking a Lean Six Sigma initiative to train and deploy frontline employees so they could become certified as Green Belts. As I worked with the candidates, I became aware of some dynamics that inspired me to consider the initiative as a case study of organizational learning.

Understanding the Lean Six Sigma Green Belt program in the context of organizational learning is important. As executive sponsors of the program seek to reap the cost and productivity savings of the program, they will be interested in the process by which these savings are generated, especially if that process impacts the quality and sustainability of the solutions and the ability of the organization to capture the knowledge acquired by individuals and teams during the process improvement process and to leverage it for future use.

I.II Theoretical Background

I.II.i Defining Six Sigma. Schroeder et al. (2008: 540) define Six Sigma as a process improvement program, distinct from previous business transformation or quality initiatives. “We

propose the following rigorous base definition that captures the theoretical aspects of Six Sigma from the case study data and literature: Six Sigma is an organized, parallel-meso structure to reduce variation in organizational processes by using improvement specialists, a structured method, and performance metrics with the aim of achieving strategic objectives."

The Six Sigma methodology used for projects aimed at improving an existing business process is known as DMAIC, for its five phases:

- ***D****efine:* Define the problem, customer expectations, and the project goals.
- ***M****easure:* Measure key aspects of the process and collect relevant data.
- ***A****nalyze:* Analyze the data to investigate and verify cause-and-effect relationships for the defect(s) under investigation and determine the root cause(s).
- ***I****mprove:* Improve the process based upon data analysis and run pilot tests to establish process capability.
- ***C****ontrol:* Control the improved process by implementing systems to continuously monitor the process.

Table 1 shows the main activities for the phases. Each of the DMAIC phases ends with a tollgate review, at which time the deliverables for that phase are due and must be approved. These deliverables are also shown in Table 1.

Table 1: Common DMAIC Phase Deliverables

Define	Establish Team Charter Identify Sponsor and Team Resources Administer Pre-Work	Project Charter or Statement of Work • Process and Problem • Scope and Boundaries • Team, Customers, and Critical Concerns • Improvement Goals and Objectives • Estimate Sigma and Cost of Poor Quality Gantt Chart / Timeline High Level Process Map Step Documentation and Next Steps Exit Review
Measure	Confirm Team Goal Define Current State Collect and Display Data	Baseline Figures (Sigma and Cost) Process Capability Measurement System Analysis or Gage R&R Refine Project Charter, including Cost of Poor Quality Refine Process Map Fix Gantt Chart / Timeline SIPOC or IPO Diagram Step Documentation and Next Steps Exit Review
Analyze	Determine Process Capability and Speed Determine Sources of Variation and Time Bottlenecks	Identified Root Cause(s) • Cause and Effect • Statistical Analyses Validated Root Cause(s) Step Documentation and Next Steps Exit Review
Improve	Generate Ideas Conduct Experiments Create Straw Models Conduct B's and C's Develop Action Plans Implement	Selected Root Cause(s) and Countermeasures Improvement Implementation Plan Validated Solutions or Improvements • Statistical Analyses Revised Flowchart or Process Map Step Documentation and Next Steps Exit Review
Control	Develop Control Plan Monitor Performance Mistake-Proof Process	Control Plan Control • Tolerances, Controls, and Measures • Charts and Monitor • Standard Operating Procedures Response Plan • Ownership or Responsibilities • Corrective Actions Validated in-Control Process and Benefits • Process Capability • Measurement System Analysis or Gage R&R Step Documentation and Final Report Exit Review Project Completion and Handoff to Owner

(adapted from George, 2002, p. 26, Table 2-1. Lean Six Sigma Tool Set, and Goffnett, 2004, p. 6, Table 1-1. Six Sigma Strategic Methodology, Section Deliverables, and Traditional Tools)

Schroeder et al. (2008) further distinguish Six Sigma as a process improvement program leveraging a team of mostly full-time improvement specialists called Black Belts. "Typically, these specialists were trained in the Six Sigma structured method through 4 weeks of training with hands-on experience in improving one or more processes" (p. 541). According to this definition, the full-time focus is one of the key distinctions of Six Sigma from past practice, when "organizations were reluctant to make the investment in full-time specialists and often assigned improvement tasks to already overworked staff on a part-time basis" (p. 548) In practice, many organizations also provide training in Six Sigma basics to most, if not all, employees assigned to projects. The employees who devote part of their work time to leading improvement projects receive two weeks of training and are called Green Belts. The Green Belt Six Sigma training and development program includes training, coaching, practice, and documentation components that are intended to stimulate both single- and double-loop learning, as the Green Belts are trained to uncover and challenge existing assumptions.

This "parallel-meso structure" of the Lean Six Sigma Green Belt program offers a unique opportunity to explore the dynamics of organizational learning and its contribution to organizational effectiveness. The structured Lean Six Sigma training and project execution method are "inherently a knowledge creation activity" (Choo et al., 2007). Also, the Lean Six Sigma program requirements encourage a systematic documentation of project results, maintenance of process changes, and quantification of the organizational impact of the projects. These documentation requirements become part of organizational memory and provide a traceable chain of feed-forward processes and feedback processes (Crossan et al., 1999). Following Green Belt projects as they unfolded over a 12- to 28-month period, allowed us to

collect rich data throughout the intuiting, interpreting, integrating, and institutionalizing processes composing organizational learning (Crossan et al., 1999).

I.II.ii Organizational learning and Six Sigma. Robey et al. (1995) propose that business process reengineering programs such as Lean Six Sigma are best considered within the context of organizational learning and that the complementarity of their relative strengths and weaknesses gives the combined metaphor of "business process learning" greater capacity for organizational effectiveness. Specifically, Six Sigma is a business process re-engineering program that has been positively linked to the organizational learning process. Six Sigma aims to result in greater knowledge, but also in the type of dramatic strategic organizational change and transformation of capabilities that provide the company with the means to achieve organizational ambidexterity of efficiency and adaptability (Schroeder et al., 2008). Despite these ambitious objectives, other studies find that Six Sigma deployments fall short of expectations.

Fewer than 2% of peer-reviewed academic papers on Six Sigma have looked at the link with organizational learning in an effort to explain this discrepancy, and fewer still from the perspective of the Green Belt leaders (Aboelmaged, 2010). Bourg et al.'s (2008) study on Green Belt program effectiveness highlights the discrepancy between the investments in training and the limited organizational returns. Referring to Argyris and Schön's (1978) distinction between learning that simply fixes the problem (single-loop learning) and learning that questions the values, assumptions, and corporate policies that led to the problem (double-loop learning), Savolainen (2007) defines learning from most Six Sigma implementations as single-loop learning and recommends further research to investigate if and how Six Sigma learning develops into sustainable capabilities and organizational learning.

I.II.iii Green Belt project leadership focus

Table 2: Structural Control and Exploration in Six Sigma

Table 1. Structural control and structural exploration in Six Sigma

Control mechanism	Six Sigma
Structural control	
Outcome	Goals & metrics
Behavioral	Metaroutine
	Tollgate reviews
	Decision rights allocation
Social	Organizational socialization
Exploration mechanism	**Six Sigma**
Structural exploration	
Boundary spanning	Multifunctional teams
	Heavyweight project manager
	Leadership involvement
Communication	Common language

(reprinted from Schroeder et al., 2008)

In the case of Lean Six Sigma, knowledge creation and institutionalization must be actively and purposefully managed for organizational learning to occur (Choo et al., 2007). High expectations of financial returns have prompted corporate leaders to invest heavily in Lean Six Sigma and the training provided to Green Belts. The formal methodology promises to create and institutionalize knowledge through active and purposeful management (Choo et al., 2007). However, returns remain elusive (Bourg et al., 2010). The mixed results experienced in deploying the Lean Six Sigma method with Green Belts and Black Belts may be attributed to a failure to appreciate the distinct challenges faced by frontline employees who are recruited into Green Belt training. Although the deployment strategy used for Green Belt training is an extension of the strategy used for full-time project leaders (Black Belts), Green Belts operate under dramatically different resource constraints and target much smaller business opportunities.

I.III Research Perspective

This longitudinal case study sought to understand how the leadership process of Green Belt projects in the CPG Canada Six Sigma Green Belt program, contributed to organizational learning. To study the role of frontline employees in organizational learning, we looked at four Green Belt projects embedded in the same business process improvement program, through the conceptual lens of the 4I model of organizational learning (Crossan et al., 1999). By bridging individual intuition, group interpretation and integration, and organizational institutionalization, the 4I model provided a framework for analyzing how employees contribute to organizational learning, including the social and psychological processes necessary for successful dissemination and exploitation of knowledge.

I.III.i Engaged scholarship. As mentioned earlier, this research originated from a request by CPG International (a fictitious name) headquarters for me, as a consultant, to design a targeted learning intervention for the deployment of its global Lean Six Sigma Green Belt program for frontline employees. This relationship allowed generous access to CPG's facilities, data, and key informants. The relevance of the topic to current business concern and the established trust in the work relationship produced very candid conversations. I was on site approximately one week per month during the first 18 months, which corresponded to the consulting request. Through this engagement, it became clear that each of CPG's 48 North American locations faced similar problems and the consulting relationship later culminated in a more focused, research-only engagement with a specific plant in Canada. Over the next 10 months, I spent 12 weeks on site with a core group of key informants, engaging stakeholders at

multiple levels of the organization in gathering and analyzing data. The ongoing nature of the relationship allowed me to observe the deployment as it unfolded over those 28 months.

I.III.ii. Research setting. The research site is a large manufacturing plant representative of CPG's North American product mix and diversity of operations. At the behest of CPG headquarters, the plant leadership team launched the business transformation program in successive waves, first training the leadership team members and then full-time project leaders. Compelling initial results prompted an acceleration of the program and the extension of the program to frontline employees.

The results of the frontline portion of the program were very disappointing, prompting the leadership team to question the effectiveness of the business transformation program and the value of including the frontline employees in the transformation efforts. Fewer than 9% of participating frontline employees completed their projects and earned skill certification. Project cycle times extended far beyond expected timelines. Project results were hard to quantify. Few project leaders cared to continue past their initial engagement. As one of the program managers told us, completed projects rarely yielded sustainable improvements. Project leaders reported experiencing and solving the same problems over and over within and across the plants. These results, which are representative of results reported in the literature (Bourg et al., 2010), were consistent across all 48 of CPG's North American sites.

I.III.iii Research opportunity. Grounded in the opportunity to learn from the high failure rate, the earlier consulting intervention addressed the urgent business needs. On the other hand, our research study focused on the leadership processes of four Green Belt projects, deemed successful enough to warrant Green Belt certification. An organizational learning lens reveals

dramatic differences between the leadership processes from one project to the other and equally dramatic differences between the short-term and long-term benefits. This experience motivated our study of the Lean Six Sigma Green Belt program at CPG to understand the role of frontline leadership in organizational learning in incremental business process improvement.

To investigate the contribution of frontline employees to organizational learning, we conducted an in-depth analysis of the dynamics of the knowledge transactions to and from frontline employees, using the 4I model of organizational learning as a theoretical frame against the background of a large business transformation initiative. We sought to answer the following question:

> What is the role of frontline leadership in organizational learning in incremental business process improvement?

I.IV Research Approach

To explore the role of the frontline leadership, we investigated how and under which conditions frontline employees contribute to organizational learning. Using an embedded longitudinal multiple-case-study approach, we worked in close collaboration with key stakeholders at multiple levels of the organization to identify cases, and collect archival and new data. With the frontline employees as the focus of our study, we analyzed the Green Belt training and Green Belt improvement project activities through the conceptual lens of the 4I model of organizational learning (Crossan et al., 1999).

The case study method has been proven effective in researching complex social phenomena including "individual life cycles, small group behavior, [and] organizational and managerial processes" (Yin, 2009, page 4). The embedded multiple-case-study design reflects a

deliberate strategy of using replication logic to surface conditions that impact the occurrence and effectiveness of the contributions originating from frontline employees.

While the case-study method allowed us to capture the complexity and fluid nature of the context within which the events happen, the engaged scholarship model of close collaboration provided rich insights into the design, data collection, and analysis of the cases (Van de Ven, 2007). The ongoing access to the research setting and research participants provided a timeline of key events and event sequences that formed the foundation of the process model of the 4I and yielded the contributions in Table 3.

Table 3: Framing of This Research

Component	Literature	Contribution
Problem Situation	Organizational Learning in iBPI	Identify key enablers and barriers to Organizational Learning in iBPI
Area of Concern	Organizational Learning	Develop our understanding of the role of frontline leadership in organizational learning
Theoretical Framing	4I Model of Organizational Learning	Defining the leadership role of the project leader and gate keepers in organizational learning. Unpacking micro-processes through which the 4I processes unfold within and through the individual, group, and organizational levels in the iBPI frontline leadership process.

I.V Summary of Dissertation

The subsequent chapters of this dissertation provide supportive arguments for this research as follows:

- **Chapter 2** reviews theoretical and empirical contributions to the 4I framework of organizational learning. It lays the foundation for the research into the process by which frontline employees contribute to organizational learning.

- **Chapter 3** describes the research setting, the overall research design, and the approach to data collection and data analysis. This chapter also presents the application of an embedded multiple-case-study approach and collaborative practice research to build a process model. The key events and event sequences explain the outcomes of the organizational learning process.
- **Chapter 4** discusses case by case results.
- **Chapter 5** explores the cross-case analysis contributions to the theoretical framework of the 4I model and to the practice of organizational learning in iBPI.
- **Chapter 6** concludes with implications for practitioners of organizational learning and practitioners of iBPI, limitations of the study and suggestions for future research.

ORGANIZATIONAL LEARNING

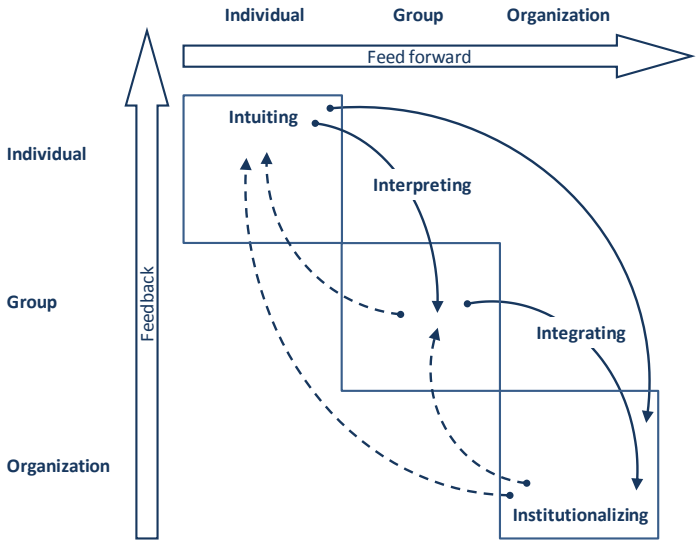
In this chapter, I review the key developments in the literature on the 4I model of organizational learning. I also describe the Lean Six Sigma approach to process improvement, which is considered as a component of the broader organizational learning process.

II.I Organizational Learning

Organizational learning, which Fiol and Lyles (1985) define as "the process of improving actions through better knowledge and understanding," has attracted attention over the past half century. However, theorists and practitioners are not in agreement on what "organizational learning" means or how it works, beyond the basic point that organizational learning is a dynamic process. Among models of organizational learning, Crossan et al. (1999) has proven to be the most comprehensive, and most cited (Crossan et al., 2011), while also capturing the multi-level processes of organizational learning. Crossan et al. (1999) distinguish organizational learning from knowledge management or other related disciplines by defining its objectives. "Organizational learning can be conceived of as a principal means of achieving the strategic renewal of an enterprise" (p. 522). They note, "Renewal requires that organizations explore and learn new ways while concurrently exploiting what they have already learned," citing the organizational tension between *exploration* and *exploitation* introduced by March (1991).

II.II 4I Model of Organizational Learning

Figure 1: 4I Framework of Organizational Learning (Crossan et al., 1999)



In introducing their 4I framework for organizational learning, Crossan et al. (1999) unified many of the existing perspectives of organizational learning by proposing a multi-level framework. Within the 4I model, four integrated social and psychological processes leverage the cognition-action and action-cognition links to manage the tension between exploration and exploitation of knowledge. Crossan et al. present the basics of their model through four theoretical premises.

Premise 1 introduces strategic renewal as the endogenous variable of interest in organizational learning. Using strategic renewal as a lens for organizational learning is important because it requires the model to address the challenge of managing both continuity and change at the level of the enterprise (Hurst 1995), tension between assimilating new learning (exploration)

and using what has been learned (exploitation). In the context of the 4I model, this process of harmonization is operationalized through the feed-forward and the feedback learning flows. Feed forward occurs as new insights and new learning move up to the organization level, while feedback consists of the exploitation of that knowledge at the different levels of the organization. In this way, organizational learning processes and outcomes are linked to the organizational requirement of purposeful allocation of scarce resources required to achieve survival and prosperity goals (March 1991). The scarcity of resources creates a competition between feed-forward and feedback and contributes to the dynamic nature of the 4I model.

Premise 2 is that organizational learning is a multilevel phenomenon that spans individual, group, and organization levels. The 4I model details the importance of all three levels in the development of the feed-forward learning flow and illustrates how both groups and individuals are influenced by institutionalized knowledge through the feedback learning flow.

Premise 3 explicitly links the three levels by four social and psychological processes.

Intuiting refers to the cognitive process by which an individual will discern something new, which results from pattern recognition from past knowledge or results from a more innovative exploration, which can be shown to be effective only after the insight has been generated and then put to the test. This dynamic replicates the tension between the exploitation by the expert and exploration by the entrepreneur at the level of the individual (Crossan et al., 1999). Since the tension between exploration and exploitation can be shown to originate with the initial insight and its subsequent outcomes, intuiting is a critical step.

Interpreting occurs as the insights are shared and explained, moving beyond the individual to the group, so a shared understanding can be developed. According to Crossan et al.

(1999), language and dialogue are critical to this stage, in which the insight moves from the subconscious to an explicit opportunity ripe for shared action.

Integrating is the stage of the feed-forward process in which coherent and collective action can occur. Grounded in the shared interpretation, integration continues the process of dialogue so that mutual agreement about significance or related actions can occur. The initial idea may continue to morph, as it is now the product of many conversations and the complexities of practice.

The last process of learning in the 4I model is *institutionalizing*. Beyond practice, which may be very dependent upon the group, institutionalizing addresses the level at which learning is embedded in the organization. Institutionalizing allows organizations to embed—in information systems and infrastructures, routines, and standard operating procedures—practices that can be leveraged beyond the initial individual or team of people from whom the insight originated. Once institutionalized, this knowledge fuels the tension that exists between learning new ways and using what has already been learned.

In this way, the institutionalization process informs and constrains new learning processes as part of the feedback loop that links the institutional level to the group level and the individual level. In enabling individuals and groups to exploit what has been learned, the institutionalization process contributes to the cognition, actions, and future intuiting by individuals in the organization.

While the literature is more concerned with how the four processes work in the feed-forward flow, Crossan et al. (1999) contend that these four processes "are the glue that holds the model together" through both feed forward and feedback.

Premise 4 states that cognition affects action and vice versa. By offering a comprehensive framework including the dynamics of generation, assimilation, and utilization of knowledge, the 4I model illustrates the importance of knowledge in informing the actions that result in organizational success and how these actions in turn generate new knowledge that can be leveraged for strategic action.

A multilevel view of organizational learning, the 4I model (Figure 1) spans the individual, group, and organizational levels through its four feed-forward processes—intuiting, interpreting, integrating, and institutionalizing—and its feedback processes to illustrate how scarce resources can be managed over time, to generate and utilize knowledge to achieve organizational strategic objectives.

II.III 4I Model in the Literature

Since the publication of Crossan et al.'s seminal article in 1999, over 1700 academic articles have cited the 4I model. The diversity of domains in which it has been used underscores its ability to explain the concept of organizational learning and its relevance to strategic organizational objectives. However, fewer than half of these articles use the model substantially (Crossan, 2011) and only nine apply it fully (Hansen, 2012). For example, Berends and Lammers (2010) contribute to the understanding of the 4I model by using a process model to examine the impact of process discontinuities. They make the case that social processes and the temporal nature of organizational learning impact the sustainability of organizational learning in key ways, but they fail to address the strategic focus of the first premise.

Though the completeness of the model contributes to its strength, few studies have explored its strategic focus, two learning flows, three units of analysis, four social and

psychological processes, and its emphasis on the action cognition link. Using the four premises as a lens for full utilization of the model reveals an even split between published theoretical and empirical scholarly articles.

II.III.i Theoretical studies. Theoretical studies of the 4I model have contributed to its development by integrating the 4I with related constructs and extended our understanding of its applicability across different lenses. For example, Vera and Crossan (2004) build on the 1999 article to explore how the leadership styles of the CEO or senior leaders impact the stocks of flow of knowledge. They make a compelling argument that both transformational leadership and transactional leadership contribute to organizational learning. They argue that managing organizational learning requires senior leaders to have a combined leadership style. Specifically, that transformational leadership is best suited to feed forward learning, because of its efficacy at managing change. On the other hand, transactional leadership might be better suited at managing feedback and its emphasis on institutionalization, reinforcement, and refinement of existing knowledge.

Mazutis and Slawinski (2008) also extended our understanding of the role of top managers in enabling organizational learning. Using the 4I model as a theoretical lens, they explore the organizational learning impact of leaders exercising authentic leadership. By creating an organizational culture of dialogue, they support feedback and the feed-forward learning flows, promoting and reinforcing double-loop learning.

In contrast to an organizational culture of authentic dialogue, Lawrence et al. (2005) integrated the dynamics of power and politics into the socio-psychological dynamics of the 4I model. They position power and politics as the social energy that fuels the feed-forward and

feedback processes and explain why some insights become institutionalized whereas some do not. Like the temporal effects contributed by Berends and Lammer, the politics of organizational learning explain discontinuities at a more granular level, which explains the fragmentation and transience observed in organizational learning. Furthermore, Lawrence et al. (2005) argue that, because specific forms of power are more effective at producing certain learning outcomes, these forms of power that might be exercised by a variety of tactics are connected to specific learning processes. They propose that intuition is linked with the discipline of being exposed to streams of experience that shape the identities of individuals and facilitates expert pattern recognition. Interpretation is linked with influence and the ability to affect the perception of the cost-benefits associated with a new idea. Integration is linked with force and the ability to impose a decision and to remove opposition. While force is considered an episodic use of power, institutionalization is linked with domination and the ability to systemically restrict available behaviors to overcome the resistance to change of organizational members.

Finally, while Sun and Anderson (2010) recognize the importance of leadership in playing an integrative role between the two learning flows, their contribution focuses on integrating organizational learning and absorptive capacity through the 4I processes. They conclude that the individual and group levels are mostly focused on knowledge acquisition while assimilation is mostly a group-level activity that is constrained by the interaction of team member characteristics and environmental factors that can either encourage or discourage the verbalization and articulation of frame-breaking insights. Transformation is aligned with both group and organizational levels through the socio-psychological and practical testing of new understanding. Sun and Anderson conclude with the alignment of the exploitation aspects of

absorptive capacity with the organizational level through its ability to leverage rewards and recognition programs and restructure organizational memory.

Each one of these studies takes a fine-grained look at the processes of organizational learning across the three levels and provides rich details about how the additional lenses of senior leadership, political power, or absorptive capacity extend the 4I model. However, they do so without the benefit of empirical validation.

II.III.ii Empirical studies. In contrast, the following studies have focused on contributing empirical validations of the 4I model. Using a case study approach, Crossan and Berdrow (2003) illustrate the phenomenon of strategic renewal through the four processes and three levels of the 4I model. The case provides an instructive empirical validation of the first premise of the 4I model by exploring the unfolding tension between exploration of new knowledge and exploitation of existing structures and how this tension contributed to the process of strategic renewal of the Canada Post Corporation (CPC). In addition to providing the first empirical validation of the full 4I model, this study expands the conceptualization of organizational learning to include a more deliberate focus on its strategic implications. A retrospective study of the 10-year metamorphosis of CPC, it encompasses the external and internal competitive drivers for strategic renewal and the top-down, feed-forward flow of ideas originating from key individuals such as the CEO. While the CPC bottom-up intuiting and interpreting activities generated significant productivity savings, they were constrained by stated goals and generated mostly single-loop learning. Managing the tension between exploration and exploitation proved so difficult that CPC eventually created an independent business structure to tackle customer-driven innovations.

Lunnan and Barth (2003) use a multiple case study approach to explore how this tension is managed through bridge teams and to what extent the learning generated by the teams is captured by the organization. Bridge teams are cross-functionally diverse teams working with a strategic alliance partner, and their work is typically of strategic importance. From comparing the case studies, the authors concluded that, on the one hand, the team with the narrowest focus exploited knowledge very efficiently but contributed very little that was new. On the other hand, teams with different comfort levels for sharing ideas contributed many new ideas to their firms but found little success in exploiting them. Another key finding stresses the need to balance formal reports and databases with informal social interactions to elicit both explicit and technical as well as tacit and relational knowledge exploration. Finally, they conclude, "Even production-oriented teams have opportunities for explorative learning and very innovative-oriented teams need to worry about exploitation. Both forms of learning are guided by the group and organizational conditions within which the team operates, including the visibility and proximity to organizational decision makers" (Lunnan and Barth, 2007).

Stevens and Dimitriadis (2004) used a longitudinal multiple-case study to test the applicability and the limitations of the 4I model when applied to new service design (NSD). While they found ample support for the 4I processes and multiple learning loops, they also found that learning processes alone could not explain all the new service decisions made. Also, they note that a weakness of the 4I model is its assertion that the building of learning at the individual and group levels results in organizational learning. In spite of the model's failure to include factors that may delay or prevent the feed forward process from unfolding to institutionalization, Stevens and Dimitriadis conclude that the 4I model extends research on NSD in two ways: by

extending the management of development projects to include activities that contribute to institutionalization by embedding knowledge, and by shaping an alternative to the linear, predefined staged development NSD approaches.

Using a grounded theory approach, Zietsma et al. (2002) examine the factors facilitating or impeding organizational learning. While they find support for the key 4I processes, they contribute two additional action-based learning processes—"attending" and "experimenting"—that address the needs of the firm to adapt beyond exploitation and internal intuiting. They propose that a firm also needs to attend to external forces, supplementing the intuiting process, and that groups also experiment to validate and integrate learning. Finally, the authors recognize the dynamics of both internal and external power and its influence on managing the legitimacy trap, defined as the tendency of an organization to dismiss challenges to its existing processes and practices if the source is perceived to be illegitimate. This may trigger further learning rigidity as organizational actors may instead escalate their commitment to the status quo.

Finally, in a longitudinal study of how IS leaders balance exploration and exploitation in strategizing, Hansen (2012) found multiple instances of intuiting and extended the 4I model by proposing that these "waves of insight" can have one individual source, as set forth by the 4I model, or they can result from multiple sources going through the intuiting process at the same time. Empirical results from the study showed that institutionalization can drift away from the defined tasks and plans and take other forms, while endogenous and exogenous events can interrupt the feed-forward process. Finally, Hansen points out the exploration bias of the 4I studies, which do not address explicitly how feedback happens through the 4I. She presents

empirical evidence that shows that the feedback loop related to a specific feed-forward flow may not happen until much later.

The seminal article by Crossan et al. (1999) was the most cited article of the decade from *Academy of Management Review.* The 4I model that it introduced has been used to illustrate organizational learning in a variety of domains (Crossan et al., 2009), with a focus on actors with a measure of organizational power, using a top-down approach to integration, institutionalization, and feedback. This focus on ideas originating from individuals with power makes it easier to relate the ideas to the outcomes of strategic renewal and the organizational-level relationship between exploration and exploitation. Reflecting back on a decade of citations, Crossan et al. (2011) stress the importance of conceptualizing learning as strategic in that it encompasses the entire enterprise and to use learning as a "rich theoretical construct to unpack learning processes" (p. 451). Having established the importance of learning as a dynamic multilevel phenomenon, they recommend research to further understand how the levels relate to each other, which makes explicit use of the 4I processes. "We believe there is the potential for much deeper insight into the 4I processes. Our original article just scratched the surface" (p. 450). Next, they identify the need for research taking an explicit focus on the integration of power, politics and emotion and the role of leadership in advancing a theory of how organizational learning unfolds. "In general, there is an opportunity for a better sense of agency as it relates to organizational learning. In the same way that a theory of organizational learning needs to anticipate insights from power, politics and emotion, it also needs to account for the role of leadership (and followership). However, a theory of organizational learning needs to consider carefully the meaning of leadership. It would be unfortunate if it were viewed solely from an

upper echelon perspective. Rather, it is evident that individuals can influence at least some of the learning processes from wherever they reside in organizations and a theory of organizational learning needs to account for that potential" (pp. 452-453).

Finally, while the 4I model has been widely cited and empirically tested, its relationship to established methodologies for business process improvement (e.g., BPR, Lean Six Sigma) is generally overlooked. The question arises, therefore, whether such methodologies are compatible with the processes specified by the 4I model or not. It is conceivable that a methodology like Lean Six Sigma, for example, may contribute directly to particular processes of the 4I model while neglecting others. In this dissertation, we explore the role of leadership in organizational learning in incremental business process improvement. We explicitly focus on the process of leadership as we apply the 4I model to study how insights generated by frontline employees are fed forward to the group and organizational levels and exploited in feedback learning loops.

RESEARCH METHODS

In this chapter, I discuss the research methodology we used to explore the role of the frontline employee in organizational learning in business process improvement. I begin with a description of the research setting and follow up with the rationale for a process model and longitudinal multiple-case-study design. I conclude with a discussion of the collaborative nature of the research, which enhances the dual focus on theory and practice.

III.I Research Setting

A division of CPG Canada, the Mont-Royal plant manufactures a diverse range of packaged foods for the Canadian and US markets. With a staff of close to 1000 employees, the plant is the largest of the 11 CPG Canada plants and the second largest of its 48 North American counterparts. The study took place between September 2010 and February 2013, with the data collection occurring in three phases from October 2010 until February 2013. The selection of the Mont-Royal plant was guided by the desire to minimize the variation of variables not under study, such as the financial stability of the plant and the maturity of the leadership team, while maximizing the diversity of potential projects from which to choose. In addition to the diversity of projects, the plant had received double-digit, year-over-year, corporate productivity improvement targets at levels that would require nothing short of a complete transformation of its business processes to achieve and sustain.

In July 2009, the Mont-Royal plant was selected as one of nine North American test sites for the corporate transformation initiative. For a period of three months, small teams of three to six experienced consultants were embedded in the organization to lead process improvement initiatives. The process improvement consultants led “demonstration” projects. Selected after a

plant-wide assessment, these projects were aimed at production problems that would test both the efficacy and the suitability of the method on the most persistent and widespread production problems. Deployed full time at the plant, the consultants became familiar figures on the production line. As experts, they worked in closed cooperation with the plant leader and the newly appointed continuous improvement managers. As project leaders, they leveraged the expertise of the frontline employees to understand what they observed, to collect data, and to implement solutions.

With so much at stake, the teams operated under strong scrutiny from corporate and plant level leadership. Formal weekly report attended by the consulting practice leaders, corporate, national, and local leaders became the norm. Successes were celebrated, failures were acknowledged as evidence of incompetence, and delays or perceived roadblocks were met with no-holds-barred public ultimatums to produce—or else.

The three-month demonstration paid off. Processes improved. Downtime was reduced dramatically. Production defects were eliminated. Targeted production lines delivered record levels of throughput. In a reversal of perceptions, a perceived capacity problem was now resolved by higher production volume. New production lines or new plants would no longer be needed to deliver enough output to meet high-season consumer demand. With improvement projects came more clarity about needed investments. Corporate decision makers rewarded results with long overdue capital investments.

The pilot quickly evolved into a corporate mandate to implement Lean Six Sigma company-wide. When the Canadian regional quality director announced the launch of the program and the improvement targets to his team, several skeptics replied, “When pigs fly.”

Despite these discreet misgivings, to avoid drawing the attention of program sponsors, training of internal full-time process improvement project leaders (Black Belts) began in January 2010.

With a charge of duplicating the success of the demonstration projects, the Black Belts began working alongside the consultants, who remained to supplement the growing team of internal project leaders. Again, early results continued to be so promising that corporate headquarters requested an immediate expansion of the program. Plant leadership teams began to recruit experienced Black Belts. Hoping to capture and leverage expertise, without the high price tag of external consultants, recruiting expanded to include Certified Master Black Belts.

"Where do you find these people?" At the request of the Senior VP of Quality, the leadership team of the consulting firm offered their own resources. Embedded consultants received the first wave of offers, but few accepted. Referrals were made. Building on the trusted advisor relationship, prospective Master Black Belts interviewed with both internal decision makers and practice leaders of the consulting firm. Encouraged by the rapid progress and the better-than-expected results, the corporate team decided to immediately extend the program to include other employees as part-time project leaders. These Green Belts would keep their full-time jobs and their job responsibilities would now include leading improvement projects part-time.

The first Green Belt training cohort began in October 2010. A year had elapsed since the demonstration projects were completed and, in many cases, internal resources were climbing a steep learning curve. The internally promoted Black Belts were still in training, with a focus on completing their certification projects. The plant's leaders were learning to manage the day-to-day production needs and the very resource-consuming, very visible, and very invasive demands

of large-scale improvement projects. They allocated their toughest or most costly improvements initiatives to the consultants, who continued to push forward, being well aware that their per diem was being weighed against the hard savings generated by their projects. The employees who had not been directly involved in helping with the initial projects were now asked to take an active role in leading projects. Corporate guidelines called for 10% of the employees to be trained as Green Belts and for each of them to complete an improvement project yielding C$50,000 in annual savings to become certified. After acquiring experience and obtaining certification, Green Belts were expected to continue to lead up to two improvement projects per year.

To meet the plant's 10% deployment objectives, a rolling calendar of training sessions was established with a new cohort of 15 to 20 Green Belts starting every eight to 12 weeks. Each cohort attended 10 days of Lean Six Sigma training over a three-month period. Three sessions, delivered by an external consultant allowed the project leaders to apply their training and move their own project forward between sessions. The first three days focused on introducing the tools of the Define and the Measure phases, which project leaders would then apply to their projects between sessions. The first four to eight hours of the remaining sessions were spent on project update presentations. The composition of the training class was very diverse, representing the full diversity of the departments, with some representation from night-shift employees. Approximately 80% of participants in the first eight cohorts were frontline employees.

The need to manage the tension between a well established, familiar way of doing business and the external and corporate pressures to fundamentally change business practices and increase plant organizational effectiveness as a building block of the corporate strategic renewal

efforts makes this plant setting a very rich environment to study contributions from a frontline improvement project. Furthermore, this setting encompasses all three levels of the 4I model of organizational learning. The ability to observe how knowledge is created through the methods of iBPI and to leverage and to study how this knowledge created by the Green Belt project leaders develops through the social and psychological processes that link the individual, group, and organizational levels contributed to make this plant very attractive for our research purposes.

As one of the consultants who led initial plant assessments and demonstration project teams, I was invited to join CPG or select an assignment of my own choosing. I led the monthly Green Belt training sessions, which gave me a level of access that went beyond my ability to speak French, Lean Six Sigma, and manufacturing fluently. I benefited from local support and corporate sponsorship, I was privy to design decisions made by the consulting firm and strategic decisions made at levels up to the Senior VP of Quality, and had monthly conversations with plant leaders. Within a year, I spoke French with a Canadian accent—or so I was told. While all managers have a very good command of English, which is the corporate language, Quebecois is the language of the frontline employees. I wore a personalized plant-wide access badge, mistakenly printed blue (i.e. permanent employee) by the security guard, who began to take my presence for granted, and rumors began circulating that I might have become an employee. To balance the access level of an insider and the practiced eye of a subject matter expert, with the objectivity of a researcher I structured the study in three phases.

III.II Conducting the Study

III.II.i Phase 1: Getting grounded—Trainer/Observer. The first phase of the engagement was an ethnographic phase from September 2010 until March 2011, when I became

grounded in the emerging CPG Green Belt program. The CPG plant was one of three North American plants in which I delivered training sessions monthly. Similar patterns of high project abandonment rates and Green Belt disenchantment began to emerge among these three plants, prompting me to validate my early insights with the team of 20 colleagues deployed in a training capacity across the U.S. and Canada. We all saw the same patterns. Also, the continuous improvement managers at these plants began to ask for help before the first training session began. They expressed concerns that, with their full commitment of resources to ongoing projects led by full-time Black Belt and consultants among other corporate initiatives, they could not support training and coaching this volume of Green Belt projects and could not deliver on the six-month expected Green Belt project completion timeline or the target of an average of C$50,000 in project savings, let alone continue to coach certified project leaders after certification.

I began to observe and collect data on the Green Belt deployment in order to prepare a fact-based recommendation that would be grounded in their organizational context. In addition to conducting the monthly training sessions, facilitating training project update presentations, and auditing detailed project data, I also had numerous conversations with the Green Belts about their project experience. Even after their training sessions were completed, I would often meet with members of earlier cohorts in the cafeteria. I chose to sit at their tables rather than the table occupied by the plant's senior and middle managers, which allowed me insight into conversations among project team members and between project leaders and other frontline employees not yet involved in Lean Six Sigma projects. I also encouraged members of earlier cohorts to stop in the training room and meet new cohort members during training days,

especially after afternoon cookies and drinks were delivered. This occasion proved to be a rich source of ongoing insights into how the project leadership process stalled or developed from month to month, which I documented and which became CPG archival data. This first phase of the project completed with my data-driven assessment that the Green Belt program was not producing expected results but that a timely learning intervention could reverse the trend.

III.II.ii Phase 2: Preparing for action—Consultant/Researcher. With the support of the Mont-Royal continuous improvement and plant managers and with the approval of the consulting firm practice leaders, I contacted the North American Senior VP of Quality, whom I had met during the demonstration project phase. We met at U.S. headquarters the day of the public announcement that the Lean Six Sigma deployment had delivered over $450 million of savings. The Canadian regional quality director was busy hand delivering nine-inch cast iron desktop flying pigs to all full-time Six Sigma resources, so it was hard for senior leaders to believe that the Green Belt program could be in difficulty when the balance of the program worked so well.

He asked me a question that surprised me: “Why are you the one telling me this?” My candid answer was that I was the one telling him about the difficulties of the Green Belt program because I was on the frontline able to see them as it was developing—and because I could. As an external consultant focused on delivering training sessions, I had the freedom from political or career consequences to look objectively and speak about what worked and what did not. I could see it happen across the board. It was not a problem tied to a specific project leader or plant. It was a systemic problem that needed a systemic solution.

In addition to project status data from the three plants I was working with, I had brought a copy of the only peer-reviewed published academic article on the Green Belt training and deployment process (Bourg et al., 2010). The first 12 words of the abstract, "With 300 Green Belt trained but business results not delivered as targeted…," made my case that this systemic problem went beyond CPG and was a well known problem, but not yet well resolved. The Agilent Technologies case (Bourg et al., 2010) was considered a success after a long, involved intervention raised certification levels there from zero to 9%.

An engaged research approach to developing a core solution addressing common problems could be deployed across the 48 North American plants. I left the meeting after suggesting that the VP of Quality ask his staff to report on the Green Belt program—not on numbers of Green Belt trained, but on number of projects completed, stable process improvements, dollars saved, and certified Green Belts. He conferred with his team and then called me the next day and approved the project. Even though it had been many years since he had earned his doctorate, he understood the scholarly scope of my request to use the site and the business transformation context for research and he graciously granted his support.

While we awaited the completion of the formal approval process, we began to contact internal subject matter experts, with mixed results. When we shared details of the redesign project, a very experienced, very successful, and extremely well respected internal deployment thought leader replied, "Green Belt? This is sh*t. We know it's sh*t. This sh*t does not work. Everybody knows it. This sh*t is a waste of time. We're better off hiring Black Belts."

My intent was to study organizational learning, but the immediate business need was to design a learning intervention to address the bottleneck of stalled and abandoned Green Belt

projects while training new cohorts of candidates. While we executed the original data collection and analysis plan, designing an intervention became the focus of the second phase of the study. Having established that the experience of the Mont-Royal plant was representative of the experiences of the other plants, we decided to focus the research project team on a small team of very motivated local actors.

I returned to the Mont-Royal plant and met with the plant leader to share the news. He replied, “Please tell me you are not going to use Six Sigma to figure this out!” I spent 12 weeks on site over a four-month period during which we exploited the data I had collected during the previous year. We supplemented that data with in-depth, face-to-face interviews with Green Belt project leaders and project team members. Even though we were well versed in the literature on iBPI and Lean Six Sigma methods and projects, the interview protocol was developed to build process models of the actual Green Belt project leadership processes.

We began with a sample of 12 members from the first four cohorts, according to project results (very successful, average, and unsuccessful) and level of Green Belt project leaders (frontline and mid-management). Mapping their process histories led us to interview their Black Belt coaches and occasionally their project champions or a key team member to complete the picture. We later coded the interview transcripts according to the 4I feed-forward process. We conducted several meetings with sub-teams representing various stakeholder groups to validate our findings, identify opportunities, and develop learning interventions together.

As we completed our recommendations, important leadership changes happened at the corporate and regional levels. The company was preparing to spin off one third of its assets as a separate business and leadership teams were preparing for a complete reorganization. Access to

consulting resources was suspended until some strategic decisions were made public. Regarding our recommendation, the decision was made to implement a part of the intervention focused on a simplified curriculum for upcoming Green Belt cohorts and to freeze other changes until further notice.

III.II.iii Phase 3: Organizational learning—100% research. Having met my commitment to the business to identify the root causes of failure of the program and design a custom intervention to address these causes within the resource constraints of the plants, I returned on site as an unpaid researcher to complete the third phase of my engagement with the Mont-Royal plant, solely focused on researching organizational learning. This stage of the study benefited from the relationships built during the first two phases.

Project leaders were very generous with their time, even if I seemed to ask the same questions I had asked a year earlier, even when I should have known the answer to the question because I was there. I asked them to answer as though I had not been there and they graciously agreed.

Oliver (the new continuous improvement manager) and I discussed Six Sigma practice and leadership theories while the Black Belt who had worked with me side by side during the second phase of the project knew the 4I model well enough to discuss case analysis at the sub-process level and debate case selection. The previous phases of the study had revealed so many causes of failure that could be attributed either to the Lean Six Sigma deployment process itself or to the process of leadership that we decided to focus the organizational learning study on the project leadership process of four frontline leaders who were all considered successful from the standpoint of the Lean Six Sigma program. As frontline Green Belts who had led successful

projects, they had already beaten the odds of "the obstacle course," as many interviewees called it. Among them, two out of four project leaders had succeeded not only in completing their projects but also in having the solutions institutionalized at the at the plant level. In one case, institutionalization extended beyond the Mont-Royal plant to other plants, even crossing the US national boundary. In the plant's vernacular these projects were "flying pigs." Their success was so unlikely as to be considered impossible. A final weeklong trip was scheduled in February 2013 to update feedback loops data and validate theoretical findings with key informants.

III.III Research Design

I designed our research at the CPG plant as a single embedded qualitative case study, to account for the emergent nature of the organizational learning process (Miles and Huberman, 1994) and the revelatory nature of cases of institutionalization and feedback of solutions generated by frontline project leaders. While Six Sigma has traditionally been focused on outcomes and variance studies, a process model was most appropriate to study "how" questions when we need to account for "the complexity of events, the need to account for temporal connections among events, different time scales in the same process, and the dynamic nature of processes" (Van de Ven, 2007: 159). Further, I elected to collect the longitudinal study data as process events unfolded, rather than later, when the project was completed. Under these study conditions, I could proceed with the data collection and begin the analysis without being biased by outcomes of success or failure that had yet to occur. Even though this approach carried more risk and I could not guarantee how interesting the cases might become until much later in the process, I mitigated that risk by collecting data about 12 units and narrowing it down to four

selected sub-cases. As an additional benefit, this collect-as-you-go longitudinal design allows researchers to capture transient effects that might otherwise be forgotten or deemed irrelevant when analyzed through existing theoretical constructs (Van de Ven, 2007).

In addition to the embedded nature of the case, my unit of analysis—the project leadership process—develops through three levels of analysis, spanning the individual, group, and organizational levels. While the CPG Lean Six Sigma case details might be unique, the intent of the comparative approach for studying the four Green Belt Project leadership process sub-units is to increase adaptability of the case findings to other settings. Table 4, adapted from Yin (2009), summarizes the qualitative research design elements used to minimize the threats to validity.

Table 4: Design Tactics for Case Study Validity

Tests	Case Study Tactic	Application in This Study	Research Phase
Construct validity	Use multiple sources of evidence	Documentation, archival records, interviews, direct observation, participant observation, physical product artifacts	Data collection
	Establish a chain of evidence	Case study protocol, case database, and case reports with interviews recorded, coded, and analyzed in NVivo	Data collection through Analysis
	Have key informants review draft case study report	Cross-functional team of key informants providing key insights, identifying rival explanations, and reviewing case report	Data collection through Analysis
Internal validity	Do pattern matching	Individual case studies analyzed and then cross-case studies performed	Data analysis
	Do explanation building	Used cross-case analysis and triangulated data	Data analysis
	Address rival explanation	Reviewed with key informant, ruled out rival explanations with other sub-cases or validate with additional examples	Data analysis
	Use logic models	Process model of key events and event sequences and longitudinal data collected to create OL in iBPI framework	Data analysis
External validity	Use theory in single cases	Used 4I model of organizational learning to plan research design	Research design
	Use replication logic in *multiple* case studies	Used replication logic in the embedded 4 sub-units: (2x2) design with literal replication (2 cases per subset predicting similar results) across 2 different patterns	
Reliability	Use case study protocol	Case study protocol and case study database used and updated to set up potential study replication in the future	Data collection
	Develop case study database	Additional researcher providing independent analysis of the data to address single researcher bias	Data analysis

III.III.i Qualitative comparative longitudinal case studies. We conducted this study as an explanatory case that illustrates the intuiting, interpreting, integrating, and institutionalizing processes of the 4I model. Prior research has tended to focus on managers, CEOs, or high-level thought leaders; in contrast, we examined insights originating from frontline employees. Unfettered access to study this contemporary event and a research design that did not require control over the behavioral events (Yin, 2009) allowed us to take full advantage of the case study method. Furthermore, the distinctive Six Sigma infrastructure (Schroeder et al., 2008) helped us trace the feed-forward and feedback paths of the solutions originating from frontline employees.

We chose the comparative case design in order to provide impartial and legitimate comparisons of cases (Van de Ven, 2007).

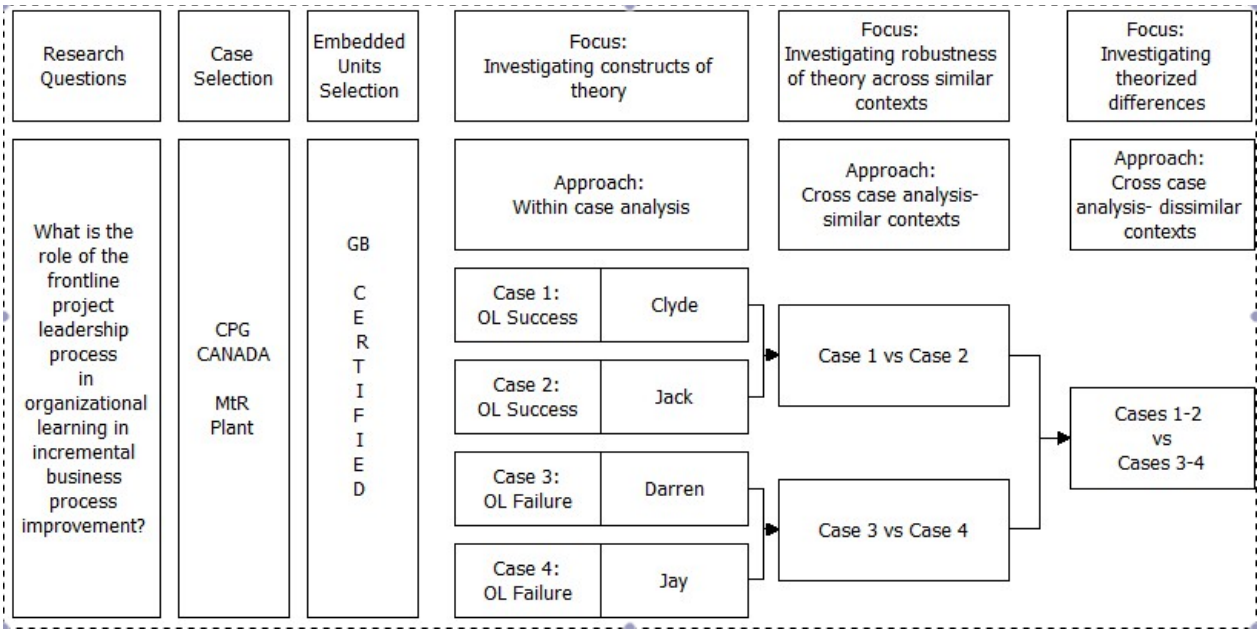
The selection process of the embedded units followed a deliberate replication protocol (Yin 2009) to set up a rigorous analysis and increase the validity of both theoretical and practical findings. Archival data and detailed documentation from four waves of Green Belt projects provided the context to operationalize the 4I model in iBPI. The preliminary data collection and analysis framework became progressively more precise as it became more focused on the twenty percent of projects continuing until completion. Project outcomes became more visible. Patterns emerged over time. Specific events and event sequences triggered key organizational learning events and led to different project outcomes. Specifically, all projects completed their Lean Six Sigma deliverables but only two led to organizational learning.

Consequently, we segmented potential cases according to these two process outcomes and, using literal replication logic, selected two cases within each of these segments to confirm findings. Using replication logic, we selected cases from each of the segments to make cross comparisons among the OL success, and OL failure cases. Building the case narratives and collecting data based on the 4I model constructs yielded unexpected results. Surprisingly, looking at the iBPI case data over a longer period and through OL lenses, revealed projects from cases 3 and 4 that appeared successful in terms of a completion timeline were much less so from an institutionalization perspective. Conversely, the two more revelatory cases initially appeared to be marginally successful (case 1) or failed (case 2).

Our final case selection, focused further on the leadership processes of these four certified Green Belts, whose projects we studied beyond implementation and sometimes beyond

project leader certification, through the feedback learning loops of the 4I model. Cases 1 and 2 were the real success stories for organizational learning. Cases 3 and 4 are successful examples of Green Belt certification but only cases 1 and 2 are successful examples of both certification and full feed-forward and feedback learning loops. Finally, to increase the rigor of the analysis phase, we collaborated with key informants in selecting, identifying, and validating rival explanations (Johnston et al., 1999). Figure 2 outlines the case selection, the replication design of the study design, and the sequence of analysis of the study.

Figure 2: Case Selection and Analysis Design



III.III.ii Process model. The dynamic nature of organizational learning and the complexity of the 4I model as a conceptual lens drove the choice of a process model rather than a variance study. The process approach allows us to understand how organizational learning occurs over time in a sequence of interrelated events and through social processes across the three levels of analysis (individual, group, and organization).

In this process study, we collected outcome data in order to provide context but also because the outcomes are significant events that have impact over time. For example, keeping the focus on the progression of events, through the institutionalization process and beyond into the exploitation of knowledge, shows that some outcomes will be more conducive to further progression of organizational learning while other outcomes will inhibit organizational learning.

Van de Ven and Poole (1995) propose four generative mechanisms that explain organizational change: teleology, evolution, life cycle, and dialectics. We adopted two of these theoretical explanations to guide our data collection and analysis. Preliminary data collection on the transfer of information is consistent with an evolutionary theory of process, where multiple entities are going through a prescribed change and must compete for scarce resources (Van de Ven and Poole, 1995). In that theoretical context, change is a continuous process and the environment has an impact on the variations that are retained and that, in turn, impact the new variations that emerge. The dialectic model is more reflective of the struggle for power, negotiations, and compromises required to change the status quo and fuel the different stages of the institutionalization process (Van de Ven, 2007). Recognizing the complexity of the process under study, we used both the evolutionary and dialectic frameworks to guide data collection and conducted a comparative analysis to see how well one each one explained our findings and decide whether a dual-motor model (Van de Ven and Poole, 1995) was more effective in explaining how organizational learning unfolded.

III.III.iii Engaged scholarship research model. I undertook this study not only to produce knowledge but also to provide rich insights as input into a learning intervention for the Lean Six Sigma Green Belt program at CPG and potentially other organizations. As such, it is a

form of design-and-evaluation research targeted at developing an understanding of the context and the program elements that explain the program outcomes. The research team includes both internal stakeholders and me as an external observer, in order to draw on a complementarity of skills and perspectives. As an example of this complementarity, I presented the theoretical framework to the stakeholders, who helped to validate its adequacy and identified areas requiring adaptation. These contributions occurred in working sessions scheduled throughout the research cycle.

I conducted the study in close collaboration with a representative sample of key stakeholders to ensure the relevance of the problem process, beginning with the problem formulation and continuing through the theoretical fit of the model, the research design and analysis, and the implications for practice. This level of participation ensures continued collaboration as key informants within the research setting may be directly affected by the outcomes of the study (Van de Ven, 2007). Outcomes potentially include discursive knowledge dissemination as well as design and implementation of practical solutions.

III.IV Data Collection and Analysis

III.IV.i Data collection. As recommended by Yin (2009), the data collection plan draws from multiple sources, including archival data, project progress reports, process documentation, interviews of projects leaders, technical coaches (Black Belts), project champions, peers, field observation, and participant observation as well as physical artifacts such as tools and parts developed as part of the improvement process. The data collected in the field setting as the events occurred was catalogued in the case study database and the interviews (recorded by

permission) were stored, transcribed, and coded in NVivo and selectively translated from French into English.

I developed the interview protocol to ensure consistency of the interview process, beginning with a semi-structured interview and ending with the construction of a key event process map that I did under the direction of each Green Belt project leader. Interviews with team members, coaches, and plant managers provided context for the interpretation and integration stages. I collected company documentation, standard operating procedures, observed routines, and prescribed practices to evaluate institutionalization, as described by Argyris and Schön (1996). Over the course of the three phases of the study, I spent 24 weeks on site and conducted 32 face-to-face interviews, varying in duration from 30 minutes to two hours, within the study's 28-month duration.

While the research design remained clearly focused on process key events and key event sequences, I also collected outcome data to provide additional context for the analysis. I used the outcome data to place the phases of the project in their DMAIC context and also to delineate the transitions from one level of the 4I model to the next. Furthermore, Van de Ven (2007: p. 23), quoting Pettigrew (1990), reminds us that "theoretically sound and practically useful research on change should explore the contexts, content, and process of change through time. Just as change is only perceptible relative to a state of constancy, an appreciation of a temporal sequence of events requires understanding the starting (input) conditions and ending (outcome) results."

While there are few published empirical studies of the 4I model, the data collection plan and coding of feed-forward processes and outcomes were guided by the input and outcomes identified in the original elaboration of the model (Crossan et al., 1999). This framework (see

Tables 4, 5), which guided the scope of my initial data collection, transcript coding, and data analysis, was then amended with additional constructs from later elaborations of the model, such as power and politics (Lawrence et al., 2005), in the next stage of analysis.

Table 5: Learning in Organizations: Four Processes Through Three Levels

(reproduced from Crossan et al., 1999)

Learning/Renewal in Organizations: Four Processes Through Three Levels		
Level	Process	Input/Outcomes
Individual	Intuiting	Experiences Images
		Metaphors
	Interpreting	Language Cognitive map
		Conversation/dialogue
Group	Integrating	Shared understandings Mutual adjustment
		Interactive systems
Organization	Institutionalizing	Routines Diagnostic systems
		Rules and procedures

III.IV.ii Data analysis strategy. Data analysis was conducted by one researcher, who worked in collaboration with key informants representing the frontline Green Belt, group, and senior leadership levels of the organization to provide context for the analysis. I gave specific emphasis to reviewing the incidents and relationships between events to ensure that the analysis is consistent with the key informants' perceptions. I addressed further discrepancies by trying to collect corroborating data or speak with other informants until both parties agreed to the interpretation. These informants collaborated in identifying rival explanations for the initial four cases and helped validate findings. Following the process outlined by Miles and Huberman

(1994), I studied each case individually with key informants before layering cross-case comparisons. Next, I studied literal replication cases together, such as the two successful 4I examples. Then, I compared these cases with the cases that failed to institutionalize.

The raw data collected includes key conversations, classroom experiences, meetings, coaching notes, and e-mails. This level of granularity for a relatively few number of cases lends itself to a comparative analysis in which the events are categorized into phases (Yin, 2009). Specifically, I began analyzing the cases by parsing the events into phases consistent with the prescribed timeline of the Green Belt training and project development through the phases of the DMAIC methodology. These phases corresponded to activities and events designed to stimulate different stages of insight generation, interpretation, and integration.

I then used a second coding scheme to follow the stages of knowledge sharing according to the phases and constructs of the original 4I model. Both categorizing schemes retained the temporal sequence and helped put additional patterns into focus.

A third coding scheme emerged from filling out contact summary forms right after the interviews. Project leaders, recounting certain key events year over year, became very animated or physically enthusiastic and their voices rose and they spoke faster when they recounted their "aha" or "light bulb" moments. They cast their eyes down and lowered their voices when they talked about how long it took them to complete their documentation and certification requirements. Their language became more guarded, prefacing the facts with qualifiers such as "I'm not saying that ..." when they spoke of lack of support from a project champion or someone with formal authority. The correspondence became stronger as the significance of key events evolved over time. The consistency of this common pattern between cases 1 and 2, in which the

Green Belts had gone far beyond their required Green Belt scope, and the emergence of a different pattern in common between cases 3 and 4, in which the Green Belts had delivered precisely within the Green Belt scope guidelines, led to coding interview transcripts for both emotional reactions to key events and motivation.

I concluded the data analysis by creating a story narrative and a conceptual model of the project leadership process in organizational learning in incremental business process improvement, from insights originating from frontline employees. The resulting process revealed micro-processes of organizational learning. When I compared these results with the additional literature on the full 4I model, I found support for the findings and used common terminology where appropriate. I built on the resulting process to define the role of the frontline project leader in organizational learning in incremental business process improvement. For the Green Belt project leader, the process and role of leadership in organizational learning describe the temporal sequence of observed incidents and perceived events, the description of the key actors, the implications and consequences of the events, and any additional contextual elements that explain the unfolding of events through the outcome (Van de Ven, 2007).

RESULTS

In this chapter, I present the results of the embedded case study conducted at CPG Canada, by providing a narrative of each case. First, I introduce the project leader of each of the four cases and the outcomes of that case. Then I study how the project leadership process unfolded through the 4I processes of feed forward and feedback. Finally, I summarize salient facts about the case.

Project leaders shared the same GB training and were subject to the same corporate guidelines and performance requirements. Each GB learned the process improvement methodology and applied it to a practical problem. They learned to use the extensive DMAIC technical toolkit to develop an evidence-based solution to a recurring business problem. Each solution was piloted and promised consistent waste reduction. Each GB became certified.

The narratives below follow the sequence of events as they happened and introduce us to the four project leaders and the context of their projects as they pursued the completion of their Green Belt projects. The training structure required the use of the prescribed DMAIC method to guide the sequence of tasks and tools used throughout the project. In turn, these project activities shaped the context within which the intuiting, interpreting, and integrating feed-forward processes unfolded. Successful Green Belt project leaders are expected to carry out the implementation of their solution through group integration. However, this group-level alignment of resources falls short of the objectives and multi-directionality of organizational learning. While all four project leaders became Green Belt certified, only our first two cases show examples of project leadership extending through institutionalization to feedback loops of learning (Table 6). In our third and fourth cases, even though our project leaders carried out their

expected project activities, the organization failed to capture or capitalize on the individual learning.

Table 6: Four Cases

	Case 1	Case 2	Case 3	Case 4
Project Leader	Clyde	Jack	Daren	Jay
Work experience	30	5	15	16
Leadership style	Collaborative	Collaborative	Individual	Individual
Project focus	Machine downtime	Transportation costs	Waste reduction	Weight variation
Project time (months)	24	24	6	1.5
Project iteration	Multi	Multi	Single	Single
DMAIC results (K)	20 K	260	0	26
Learning results	Success	Success	Failure	Failure
Learning flow	FF/FB	FF/FB	FF	FB
Individual	Yes	Yes	Yes	Yes
Group	Yes	Yes	No	No
Organization	Yes	Yes	No	No

IV.I Case 1: The Learner-Sharer

IV.I.i Project leader: Clyde. When he joined CPG Canada 30 years ago, Clyde did not know that he would play such a central role in the plant's ability to renew itself in response to the productivity mandate of the new CEO. His full-time job requires him to supervise the 40 electro-technicians deployed to repair and maintain the many production lines of the100-year-old plant. When the corporate mandate to train Green Belts was announced, he volunteered to be part of the very first cohort of trainees. In his own words, "I was told, 'You're too old for this. You don't need this. Why would you want to do this?' But then I told them, 'If you are going to send my people to do this, I need to go so I know what you are asking them to do.'"

IV.I.ii Project focus. Clyde selected to focus on "M42 machine downtime" for his application project during the iBPI training. The objective of the project was to use the DMAIC

approach to identify the root cause of the problem and to devise and implement a sustainable solution. The stretch project goal's objective was to reduce machine downtime and repair interventions by 75% within three months. Achievement of the learning objectives was measured against the development goal of project leaders to be Green Belt certified within six months, after having demonstrated the ability to apply the methodology and to successfully document the learning.

IV.I.iii Green Belt project outcomes. Over the course of the following 24 months, Clyde and his project team completely eliminated the causes of defect, prompting the parts supplier to inquire, "Have you converted to a different machine?" Going from 315 parts replacement per year to zero in the six months following implementation of the solution exceeded the stretch goals. Clyde is now Green Belt certified and the solution—which included a new part, new routines, and a new diagnostic system—is also sustained.

IV.I.iv Transition to organizational learning. To accurately diagnose root causes and enable a successful control phase, Clyde leveraged a diagnostic software he knew would be of value throughout the organization. Beyond the success of his project in decreasing machine downtime and reducing maintenance interventions, his leadership in advocating for the company-wide institutionalization of the diagnostic software makes his case revelatory of organizational learning.

IV.I.v Case 1: Feed Forward

IV.I.v.i Intuiting. Being an expert who volunteered to attend the training session and selected his own project, Clyde approached the Define, Measure, and Analyze phases of Six Sigma with the confidence of a veteran at solving equipment malfunctions. "I knew it was the

speed of the machine. It had to be. Absolutely. I mean, what else could it be?" The first divergent insight emerged as expert certainty failed to match collected data. Even after he checked for mistakes, the plot from the data collected during the following three weeks showed no correlation between machine speed and downtime.

In the second iteration of the Measure phase, Clyde cast a wider net for data. Gathering his team members (his "customers," as he calls them), he shared his earlier findings, that variation in speed and throughput did not cause the excessive machine downtime. Then he invited them to join him in brainstorming potential causes. After a spirited discussion on the merits of collecting various machine and performance parameters, including many anecdotes of personal involvement in getting the line back in production, the team compiled a list of potential causes.

The analysis of the data collected in the following two weeks revealed an unexpected pattern: 90% of the broken parts causing machine downtime and consuming maintenance resources were concentrated among six specific parts positioned diametrically opposite from each other. The pattern was so specific that Clyde knew that he had found a clue to the root cause and a new set of questions focused on what differentiated these six parts from the remaining 12 identical parts arranged on the machine.

The answers to these questions became clearer when the team members gathered on the production floor and examined the configuration of the six parts. A cross beam was found to be generating excessive friction, causing the six parts placed along the beam to fail at a much higher rate than their counterparts arranged in a circular pattern. Observing the machine helped the team come to their "aha moment" and make sense of the new data.

The finding was counter-intuitive at first. However, after resolving the initial incongruity between their expert opinion and unexpected data patterns, the team developed a joint understanding of the causes of the problem. Clyde's excitement was obvious as he reported his findings during the second training session. In addition to summarizing the need for the project, he presented fishbone and concentration diagrams representing the team's contribution to identifying potential root causes and the frequency and location of broken parts.

IV.I.v.ii Interpreting. The transition from intuiting to interpreting occurred as team members discussed their experience of coming up with ideas and developed common language and reasoning to explain and support their findings. The need to find the root cause of the problem created a context for developing a common interpretation of the findings and a basis for developing a potential solution. In order to help collect the data, Clyde used a diagnostic system called Pro, which enabled him to get detailed and frequent data points. Now that they knew what they were looking for, they noticed that they could detect signs of variation in machine performance approximately two days before the parts failed.

The interpreting process spanned the end of the Analysis phase and the entire Improve phase. The true test of the success of the interpreting process was revealed and tested as the team moved from analysis of the root cause to developing a solution. They identified two potential courses of action. The first option was to use Pro as an early detection system to replace failing parts proactively; this option would eliminate all downtime. The second option would be to reconfigure the parts at a 90-degree angle; this option would eliminate downtime and maintenance interventions. The team agreed that the second option was the better option to truly improve the process and provide better long-term benefits.

The interpreting process and corresponding alignment of language occurred relatively quickly because the team went through the intuiting process together. The shared insight producing experience, primed with a mutual goal and common mode of enquiry culminated in the physical observation of the internal configuration of the machine. This shared "ha-ha" facilitated the development of shared cognitive maps, shared language, and shared visuals to represent the developing agreement. At the end of the interpreting process, the team had a proposed solution that addressed the root cause, design drawings and specifications for the solution, and the timeline for production submitted by the parts supplier.

IV.I.v.iii Integrating. The integrating process began with the adjustment of group behaviors to accommodate the new standard operating procedure. Since the solution was designed to avoid the problem, the only interventions would be by the maintenance crews to replace the parts. The new parts built by the supplier were installed and a performance dashboard was created to monitor performance.

Early results showed an increased number of breakdowns. The new solution proved to be even more problematic than the status quo. The team quickly rallied to diagnose the cause of the new failures and evolved the design to further reduce friction. It took several months for the new parts to be redesigned, during which time the team members resumed their normal activities.

No one anticipated that months would elapse between identification of the root cause and implementation of the new part. Had they known, they might have used option 1 (preventive maintenance) as an intermediate solution. However, when the new part finally arrived, the team members quickly installed the new parts. The new design proved successful. Repair interventions and part replacements, which had numbered over 300 per year and caused production downtime,

were virtually eliminated, prompting the parts supplier to wonder if the machine had been replaced.

The outcome artifacts were new SOPs, new product specs, an update of the product catalog to remove the specs of the previous part to mistake-proof the ordering process, and the real-time dashboard showing the archival of performance data to diagnose any future performance variations.

The solution to the Green Belt project was impressive because it uncovered a previously unknown cause of variation and virtually eliminated defects without requiring additional follow-up steps for the operators. While the new part solved a problem specific to this machine, the diagnostic system that enabled a very complete, frequent, and low-maintenance collection of data addressed a need experienced by all project leaders and many process owners: easy access to diagnostic data. (Figure 3 shows the loops of learning at the individual and group levels.)

The project served to illustrate the power and effectiveness of performance data to quantify failure costs, identify root causes, test solutions, and monitor ongoing performance. In parallel to leading the integration of the practices with the M42 machine, Clyde shared his insight about the performance improvement opportunities inherent in using the Pro software. He began using opportunities to share his Green Belt project results to endorse and recommend Pro. In fact, he served as subject matter expert and presented an introduction to Pro to the next three cohorts of Green Belt candidates. He also made a member of his team available to help other Green Belt candidates to program the system and support the data collection process for their own projects.

Integration of learning by Clyde's Green Belt project team members led to the utilization of Pro as a data diagnostic and management solution by several cohorts of Green Belt project teams and team leaders. In turn, their subsequent successful utilization of Pro became a salient topic of conversation among project leaders and project team members who commiserated about the time-consuming demands of the rigorous data-collection phase. In contrast, Green Belts who could leverage Pro in their data analysis showed off their sophisticated statistical data displays. This second group of project leaders had the dual advantage of an effortless and rigorous data collection that enabled them to complete the Measure phase and more of the Analyze phase, causing envy among their peers who had yet to use the software.

Over the course of the following two years, usage of Pro in Green Belt projects, which remained elective, grew to approximately 70%. A community of grateful users continued to develop as Clyde continued to actively endorse Pro and support new project leaders learning to use Pro throughout the DMAIC phases. New Green Belts learned to use the data mining capabilities of Pro to facilitate the intuiting, interpreting, and integrating processes of new learning related to their improvement efforts, be it machine downtime, customer complaints or excessive weight variation in finished goods. Pro gave them an advantage in accomplishing their own process improvements. Often, these grateful Green Belts also became Pro advocates, helping to support additional feedback loops at the individual and group levels. As Clyde said, "I have my lieutenants."

IV.I.v.iv Institutionalizing. Clyde's advocacy efforts were also directed toward decision makers and influencers, such as the business unit managers and the plant's continuous improvement/quality manager. The continuous improvement manager was able to influence

usage of Pro within his team of full-time project leaders. Over time, it became the default tool for data needs, achieving a 100% penetration rate.

Also, these new users continued to evolve the use of the software for increasingly sophisticated applications. A salient example is how Stan, a newly hired Black Belt, used Pro to build a real-time diagnostic system of the production line with Pro. Stan joined the company after Pro was institutionalized as the standard data-mining tool for project leaders. During the regularly scheduled quarterly Pro training session, he learned how to use the software to create data tags and have the corresponding performance information captured for future use. Based on his prior work experience in aeronautics, Stan saw how he could use Pro to collect data about all the inputs, outputs, and key process metrics on each component of the production line simultaneously; translate it into performance parameters automatically; and instantly feed that information into the visual schematic of the full production line he had built on his computer. Stan had just created a complete, real-time, remote and portable diagnostic system of the production line he was responsible for improving.

When Stan began his project, there was limited information available about the machines and their performance on the production floor. The equipment manuals were no longer relevant because the equipment had been modified over the years. The operators and technicians who worked with or maintained the machines on a daily basis sometimes offered unreliable and contradictory advice on machine problems. Now, Stan could see the sequence of events and the relationships between any two or more tagged variables. He could look at the full production line or focus on a specific machine. He could ask better questions and generate valid answers with

data. He could audit performance levels and detect failures either from his cubicle or from the production floor because his diagnosis tool was portable.

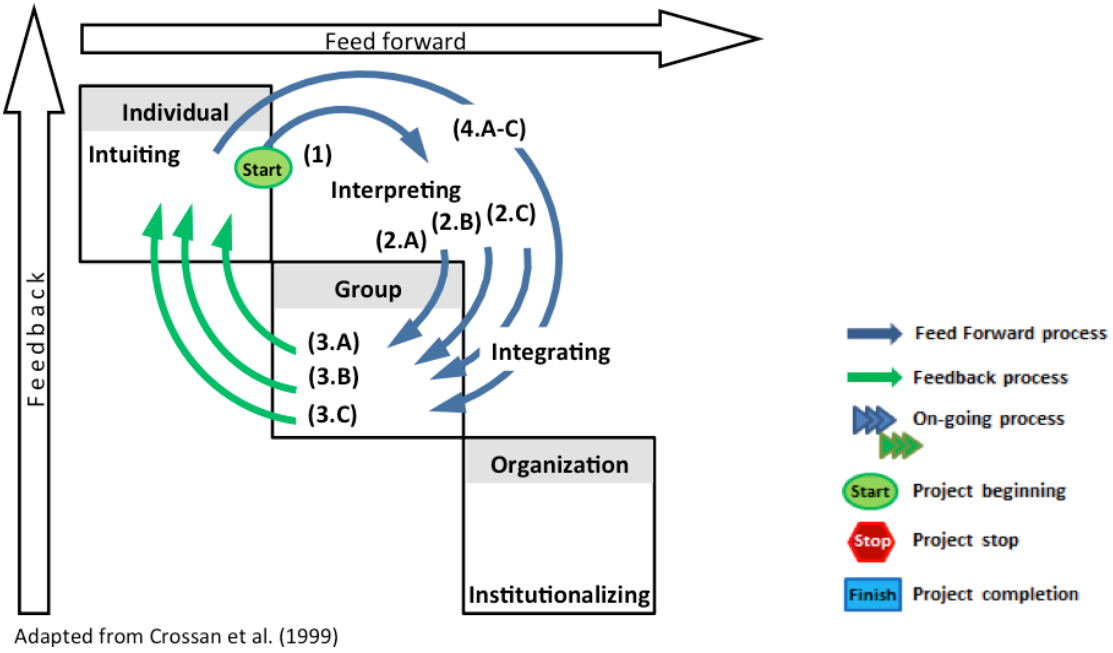
Stan used this information to facilitate a deeper dialogue with the operators and maintenance staff. He could put their insights into the context of the data and help them understand the impact of different work processes or human interventions by showing them the immediate and long-term impact. For example, the impact of modifying machine settings was visible not just in their immediate field of vision but also at later stages of the production line. This capability proved invaluable in identifying transient effects or episodic malfunctions that some operators had reported but that were hard to capture after the fact. Together, they could resolve the apparent inconsistencies of the previous incidents. By using the visual displays to make sense of their diverse experience, Stan could facilitate the group process effectively. They could develop a shared understanding, create better solutions, and build a foundation for group problem solving.

The new diagnostic tool accelerated the intuiting, interpreting, and integrating loops. It contributed directly to inter-organizational learning when the continuous improvement manager of the U.S. plant saw a live demonstration of Stan's diagnostic model. Hearing about it second hand produced mild interest, but seeing it live provoked her to stare at the screen, interrupt the meeting, and walk to the plant manager's office to make an impassioned and urgent request for this solution: "I need this. Now!" The extent of her commitment is even clearer when we consider that implementing this software would require replacing current software provided by one of the company's preferred suppliers. However, because the solution was already vetted and proven through a large number of projects, the continuous improvement manager could make the

requested change with confidence. (Figure 4 shows institutionalization and waves of feedback to the group and individual levels.)

IV.I.vi Case 1 summary. Figure 3 uses Crossan et al. (1999)'s representation of the 4I model to display the individual and group level loops of learning. The process begins within the upper left quadrant when Clyde became acquainted with the program and attended the initial Green Belt class, which set the corporate context for the intuiting process. The first arrow (1) represents the transition of the initial insight from intuiting to interpreting. The individual insight about project selection set the project in motion and led to further insights, including the secondary insight about using Pro.

Figure 3: Case 1, Phase 1 - Successive Loops of Learning



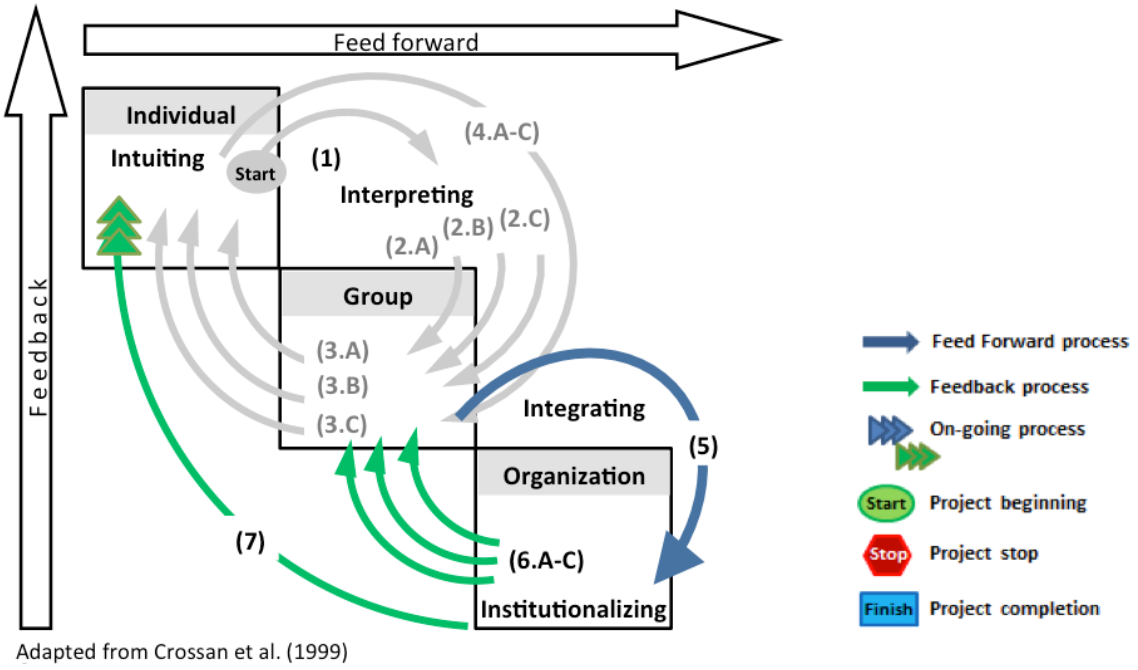
Adapted from Crossan et al. (1999)

Next, a set of arrows (2) within the group level links interpreting to integrating. The A thread represents the unfolding group learning about the M42 machine downtime, while the B thread represents the unfolding learning about Pro. The conversations that Clyde's team had during the interpreting process also instigated distinct learning flows from fellow Green Belt project teams as they explored using Pro for their own projects (C). The learning flows continue The C thread of arrows represents this additional branch of group learning.

The third arrows (3A-C) show the feedback loop from the learning of the Green Belt teams from Clyde's cohort to project leaders from new cohorts. The feedback loop happened in formal and informal ways. Best practices sharing sessions during Green Belt training began the dialogue, which continued in more casual ways within their natural work teams and networks of everyday relationships. The tangible examples of project applications from the integrating phase and the sharing conversations added to the Six Sigma program focus on process improvement to create the new foundation for the next flow of feed-forward learning (4A-C).

Clyde's case showed successive waves of learning and sharing, resulting in further individual and group learning processes occurring concurrently. As a result, a larger group of learners, and a stronger network of learning built over time. The specificities of each successful application added to the body of knowledge and social connections the interpreting and integrating processes depend upon. The increasing awareness and credibility led to faster adoption and integration of Pro. A large network of support built at the individual and group levels before moving forward to the institutionalizing process (Figure 4).

Figure 4: Case 1, Phase 2 - Institutionalization and New Waves of Feedback



Adapted from Crossan et al. (1999)

The institutionalizing process is distinguished by the transition from mutual adjustments to routines, diagnostic systems, and rules and procedures. This arrow (5) represents the learning flow from the collective learning from learning streams A-C and the resulting new insights into how to leverage Pro for a larger audience and for a longer timeframe. From a sporadic data collection and analysis tool they began to develop it into a more systematic diagnostic system to validate improvements and to monitor for sustained performance. The transition to formal and sustained social and organizational learning structures, such as the required Pro training for full-time iBPI project leaders, became possible through the authority of a member of the leadership team. The senior level advocacy of these high level gatekeepers was necessary to sanction new rules and replace old procedures.

These new rules and procedures made the learning about Pro available to project teams (6 A-C) and project leaders (7) who had never met Clyde or members of his original Green Belt team. The learning process still involved social and psychological processes but no longer depended on knowing the individual who began the organizational learning process.

A new normal had replaced the feed forward flow and become the foundation for new insights. Overall, we observe a very collaborative process progressing from the individual, group and organizational levels through a sequence, which follows the high level order of 4I processes in somewhat less linear than the theoretical model indicates.

Clyde's case shows that it is possible to institutionalize knowledge emerging from a frontline Green Belt project. However, the project leadership process, which enabled institutionalization of the learning at the organizational and inter-organizational levels, is far beyond the scope of work defined for Green Belt project leaders. Even so, institutionalization became possible through a senior stakeholder who understood the organizational relevance of Pro. Over time, the leadership role was shared by the frontline leader who led the development of the insight into a practical solution, the process owner who influenced its sustained application at the group level, and the senior leader who championed the institutionalization at the organizational level.

In this case, Clyde wore two hats, as both the Green Belt project leader and the process owner, which facilitated the transition to group-level integration. Also, by actively disseminating his knowledge and experience and consistently supporting others in using Pro, Clyde helped build a wide and deep network of support for Pro, which lowered potential barriers to institutionalization. The prolonged group-level integration phase equipped the champions with a

proven solution with a wide network of support, internal expertise and experience, and a history of success in addressing an enduring shared need.

Over time, Clyde's leadership role evolved into the role of a subject matter expert. He continues his advocacy at the project and plant level. He says that there is much work yet to do. "We have just begun to scratch the surface of what we can do."

IV.II Case 2: The Learner-Leader

IV.II.i Project Leader: Jack. Jack is an engaging young, second-generation CPG Canada employee. Following in his father's footsteps, he is seeking to move up to a supervisory role. Volunteering to attend Green Belt training, meant juggling night shift work to attend daytime classroom sessions. When staffing shortages required him to fill in for his supervisor, Jack interrupted his formal Green Belt training to devote himself to managing the small team. His role as full-time team leader in the plant-wide raw materials receiving department gave Jack access to productivity opportunities that would have been invisible to employees outside the department.

Recalling his early involvement, Jack says, "I was interested. When they said they were looking for volunteers for this training, I gave my name. When they approached me, I think, it was for the third wave. … I had a project idea. I brought it up to Oliver [the continuous improvement manager at that time]. We really talked about it. I already had ideas. Concrete sort of stuff about what to do. Where we would go get it. I was in there from the first session. I could just choose my project. It went pretty well after that."

IV.II.ii Project focus. The plant's receiving department was traditionally considered a cost center and the cost of the pallets used there to receive and store materials from suppliers was

accepted as a normal cost of doing business. Jack saw an opportunity. “My project was on the pallets. We spend over $1.4 million a year. So, I estimated about 10% overall if you look at the whole process, all the gaps. I thought in the end we could save 10%. That’s what I was able to do. For sure, it required a kind of discipline. You had to stick with it. So I had to [stick with it].”

IV.II.iii Green Belt project outcomes. In order to achieve the overall financial objective, Jack needed to identify specific saving opportunities in the process. He began by engaging his work team in mapping the receiving process from the preparation of the production report that generates the raw materials order to the unloading of the pallets at the receiving dock. Using DMAIC tools to evaluate the process steps, Jack focused on rush orders due to delivery delays and inaccurate deliveries as two costly, time-consuming, and non-value-added aspects of the receiving process for pallets.

The projected financial benefits from Jack’s Green Belt project exceeded the $50,000 corporate savings target. Within 18 months of starting his project, Jack had exceeded his initial financial objective, with 12.5% of sustained cost savings. The simplified receiving process was more accurate and enabled a reduction in pallet lead times, from two weeks to four hours. However, Jack’s Green Belt certification lagged for another year until he completed his formal Green Belt training and DMAIC project documentation.

IV.II.iv Transition to organizational learning. “Groundhog Day.” This is the movie metaphor that Jack shared in reflecting back on the repetitive nature of his project experience. Once engaged in the improvement process, the team identified additional opportunities that were out of scope for the initial Green Belt project. Using the momentum and enthusiasm generated by the first success of this project, Jack led two additional consecutive improvement loops, trying

over and over again until they were successful. Beyond the financial success of his project, which saved close to 18% under the previous year's budget, Jack learned how to learn and how to lead a transactional Green Belt process improvement project. His project became the plant's best practice for transactional Green Belt projects.

IV.II.v Case 2: Feed Forward. The feed-forward flow began with Define and unfolded through the Control phase of the DMAIC process. However, the commitment of the team to continue to improve the receiving process encouraged them to extend the Control phase beyond what would be required for Lean Six Sigma certification to a level of institutionalization that enabled a skillful transition to feedback loops. That scope expansion was facilitated by the fact that the processes under review were concentrated within the receiving department. Although the sub-processes leading to integration and institutionalization involved different tasks, they were conducted by the same employees at the group and organizational levels.

IV.II.v.i Intuiting. "Where I really benefitted was from listening to my peers," Jack explained. "Sometimes … maybe at the beginning. It's not my thing. I did not really intend to bring in many people and have a working team. I wanted mostly to work solo. That's pretty much my nature. I really benefitted a lot, you know, … from listening to my peers, the people who do the work. That's something I learned … to really listen to them, … trust the people who do the work everyday. Sometimes you may think so and so [they] cannot really teach me anything. But everyone— even in life—everyone can teach us something at some level or another. So, that's where I really benefitted."

Working with a transactional process, as opposed to the manufacturing process with machines that could be modified, Jack understood that implementation of any solution would

depend on the willingness and engagement of the team of operators working day to day with the pallets. It began as a simple strategy to build buy-in.

"I came prepared. I brought the doughnuts. I brought the coffee. I asked, 'How much do you think these pallets cost us per year?' Someone guessed: '150 K.' And I said, 'No. That's just 10 percent. That's what we can save if we improve the process.'" He told them that CPG was spending over $1.4 million a year on pallets. Jack said, "They could not believe it. People did not know how much it cost and so when they found out the cost they became really interested."

The outcome of this first meeting convinced Jack that engaging his team could do more than just build acceptance. It was the key to getting insights and a level of commitment and ongoing support that would sustain successive waves of improvements. This shift in perception of his role as leader served Jack well. In fact, the insight that shifted the momentum of the team from curiosity to active participation was generated during the next team brainstorming session.

Typical iBPI strategies include identifying areas of lower performance to target improvement efforts. As Jack was reviewing objectives with the team in the Define phase, they brainstormed potential areas of intervention. As Jack recounts the meeting, one of the team members interjected that what stood out was the exception process where receiving ran really well. "We might be better off making the whole thing like the exception rather than trying to fix the rest." "The rest" referred to the very broken and cumbersome standard receiving process. What was said in a humorous, somewhat ironic tone highlighted not only the inefficient state of the current process but a concrete path forward. After the guffaws quieted, the whole team enthusiastically discussed how much better the exception process worked and what it would be like if the entire receiving process worked equally well.

In this case, the intuiting process occurred in a group setting. Jack primed the conversation by preparing and organizing the brainstorming session. In this context, the insight was verbalized by a team member and then quickly discussed by the others, who reviewed their experiences and came to similar conclusions. Their enthusiastic reaction convinced Jack that this was an idea worth pursuing.

IV.II.v.ii Interpreting. Within the work team, the transition from intuiting to interpreting occurred when the idea was spoken. Since that happened in a group context, where team members were focused on the same problem, the interpreting process quickly moved to a group process. Discussing the idea among themselves led to converging on a similar insight. Grounded in their own experiences, the team members rationalized changing "the rest" of the receiving process to be more like the procedures used for exceptions. Listening to them voice their arguments in favor of the streamlined process used to prevent production downtime and remedy shortages in high priority materials, influenced Jack decision. This was a strategy worth pursuing.

A Green Belt project leader is tasked to study the process and recommend changes. Implementing these changes, however, went beyond Jack's scope of control as team leader. The changes would involve not only changing internal processes but also changing processes involving two suppliers and another nearby plant. In order to make those changes, he would need to secure the sponsorship and commitment of his business unit managers to move forward.

Leveraging the Measure, Analysis, and Improve phases and the support of his team, Jack began to build a case that he could share with the internal decision makers. He built a coalition of support with representatives of the pallet supplier, who had experienced similar inefficiencies,

difficulties, and complexities in their relationship with the transporter and had also deployed Six Sigma. Since Jack's receiving department and the pallet supplier shared an interest in the process, shared dissatisfaction, and shared the DMAIC language, Jack and his team found it easier to create a stronger proposal for change.

On behalf of this team, Jack presented the facts to his immediate leadership team and then with their support, to corporate decision makers. He included the details of the financial opportunity, the process maps showing the complexity of the existing process, and reports showing the cost of delays and inaccuracies caused by the inefficient order-to-receiving process. He contrasted these reports with reports showing the level of performance of the exception process, to allow the decision makers to come to the same conclusion as his team: "Why have we not done this before?"

Despite being visibly cumbersome, the existing process order to receiving pallet process had been maintained because of a corporate decision made at a much higher level and a perception that it was more cost-efficient. As Jack later explained the situation, "We knew in our gut that it did not work, but we were told that this is saving 100 grand a year so we kept it that way. Someone at corporate had been persuaded that we saved money this way. But that is not true." In Jack's words, the rigor of the project data, the context of the iBPI program and the support of the pallet supplier had enabled him to reach the "high spheres of transportation at CPG international headquarters" to successfully challenge a corporate mandate.

Following the agreement to move forward to pilot the process change on a large scale, Jack and his team created new standard operating procedures, roles and responsibility descriptions, service-level agreements, and performance dashboards.

IV.II.v.iii Integrating. The integrating process began with the realignment of internal and external resources for the two-month pilot. Having involved so many people and escalated his request through corporate headquarters to obtain permission to conduct the pilot, Jack felt conspicuously exposed. "One thing is clear," he said. "I had my head on the chopping block."

To mitigate his risk and his fear, Jack pursued the integrating phase by continuing to engage his team. "We needed to make it [the solution] live. It was there but it wasn't living, so that's what we needed to do. So I told the team, … if we can make it live, everybody wins…. And that's what happened." The team played an integral part in monitoring performance. "They could flag any variation, either excess or lack of pallets, so we could manage this closely. Of course, …. we let them know how much it costs and why it's important. I was not doing this by myself. That was nice."

During our second interview, about seven months after the successful pilot, Jack looked back at the replacement of the old process and adoption of the exception process as the new standard by saying, "I do not really have a full year of data to show, but yes, it is working. In fact, for the past three weeks, it has been happening without me being involved at all."

When asked about his Green Belt certification, Jack apologized. "I did not complete all my training and I have not really documented what I did. That's what's missing. But really I am not sure all this is necessary. I did what mattered. I have recouped my personal investment. Sometimes you can have nice numbers but in reality nothing happened. But not here. We really changed something."

Jack became so engaged in managing the improvement project that he canceled his last training session. The continuous improvement team thought that Jack had dropped out of the

program. When I reached out to him in the second phase of the research, to help explain the causes of project attrition, I was surprised to discover how far the project had progressed. Jack explained that his full-time responsibilities on the production floor made it very difficult to focus on his formal project deliverables. Jack's focus on "doing what mattered" allowed him to move the project forward even though he had little time and frequent interruptions. Against this backdrop, he saw no value in keeping up the formal DMAIC project documentation requirements: that was just for certification. Claudia, the Black Belt who manages the Green Belt certification program re-established the dialogue and helped ease the steep learning curve of the analytical tools. With her support, Jack could both learn and focus on leading the team.

IV.II.v.iv Institutionalizing. Jack arrived at our third interview a year later with a confident stride, square shoulders, his head held high, and a satisfied smile on his face. He immediately handed me a copy of his project documentation. "This is what I presented to the Green Belt certification panel." In the wake of the successful pilot, Claudia had challenged Jack to complete his Green Belt certification. Jack attended the third and final formal training session, which closes with the Control phase, with its emphasis on the need to create processes to sustain positive change and to document project findings. When Jack presented his results to the plant certification panel, he could easily demonstrate his path from project selection and problem definition to solution implementation and process control. Jack's emphasis on "doing what matters" was underscored by the fact that his impressive financial results had been validated by the plant's finance manager.

What initially appeared to Jack to be a bureaucratic requirement motivated him to finalize the new standard operating procedures, roles and responsibility descriptions, service-level

agreements, and performance dashboards. That level of operationalization and documentation signaled the transition from integration to institutionalization. The change, which had become the default mode of operation for the team, could now survive even if Jack moved on and even if there were a drastic team turnover or a new team took over the function. Jack could now share performance data throughout the organization, reinforcing the positive changes and new understanding of the true cost structure of transportation. That performance stability and acknowledged shared success provided a strong foundation and a fertile context for additional rounds of improvement.

IV.II.v.v Feedback loops within the plant (organizational to group level). When he began the iBPI project, Jack told the team, "It's not *my* project, it's *a* project. And I need your help to see it through." Once the team accepted Jack's invitation, the process of leadership changed. Over time the team members took more and more initiative, making further suggestions and volunteering to help, and Jack then managed the flow and focus of work. While the team members remained engaged throughout the subsequent loops of the improvement process, Jack reports that he needed to moderate the enthusiasm of the team so they could move forward to other improvements while he needed to focus on integrating changes.

The desire of the team to improve the process beyond its new level of performance reassured Jack that the control phase would lead not only to documented changes but also to stabilized improvement behaviors. Thus, resources could be freed to invest in the next level of improvement without jeopardizing the results of the newly integrated changes. "It was maybe more than a Green Belt project," Jack said. "It was more like three small Six Sigma projects one after another that produced this big result."

IV.II.v.vi Feedback beyond the plant. The benefits of the institutionalization process extended beyond the team and beyond the plant. Project leaders from U.S. plants who were searching for productivity improvements in their receiving departments sought Jack as a resource. "I received this call from a continuous improvement manager from a plant in the U.S. He was wondering if we would be able to save money by centralizing the transportation process through corporate. I don't know how he got my name, but I was not only able to tell him what I did not think this was a good idea but I was able to send him my whole presentation."

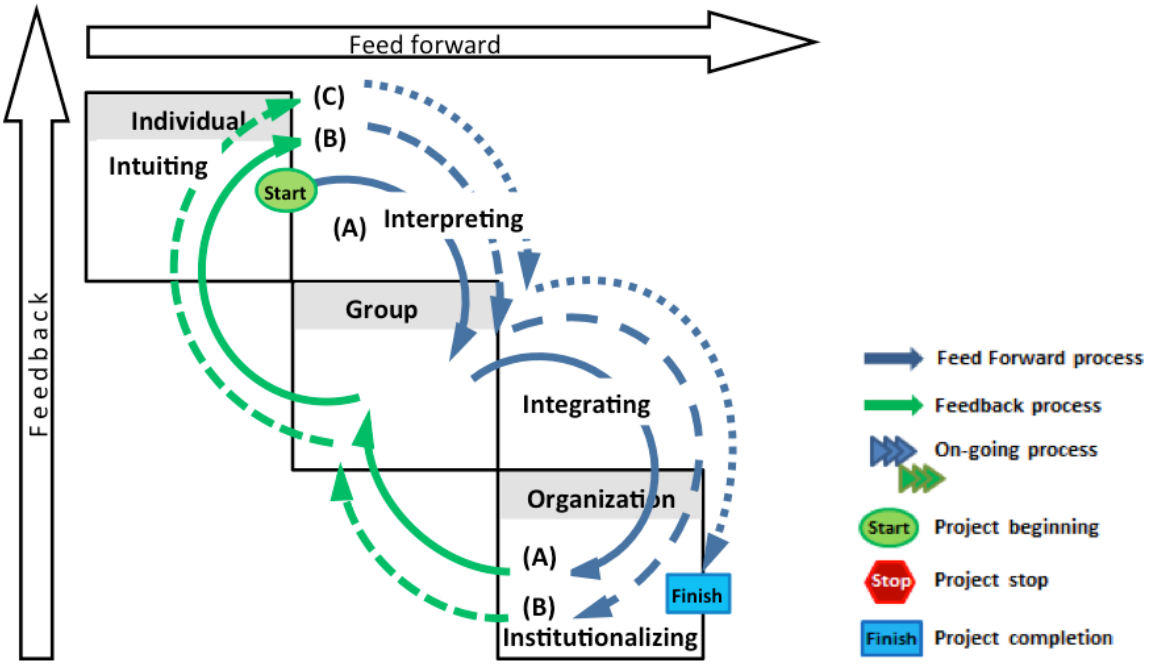
Jack closed our third interview with a final reflection, knowing that his experience was atypical of the experiences of other Green Belts. "I was expecting a lot more resistance, you know. But that did not happen. People who work on the floor kept saying, "So, how is it going? Am I going to get my name someplace? They were really supportive. … I know, it sounds like a fairy tale. I was really lucky."

After a few incremental moves in other parts of the plant, Jack moved back to receiving, now as the department's supervisor. When I asked about the performance of the process, he was happy to report that he does not need to follow up because he knows it is working. "I trained the woman who replaced me as team leader. She knows which data to pull. The results are posted on the floor. But I don't need to look at it at all. They take care of it. It's their baby."

IV.II.vi Case 2 summary. Figure 5 shows the sequential loops of feed-forward and feedback flow which sustained the dynamic learning environment of Jack's working team. Jack used the narrow focus required of a well scoped Green Belt project (A) to concentrate his efforts and the support of his team on delivering a successful solution to his initial project requirement. The solid blue arrows show the feed forward flow of his project, all the way through

institutionalization. The first arrow spans the individual and group levels to show the intuiting, interpreting and integrating processes.

Figure 5: Case 2 - Sequential Loops of Feed-Forward and Feedback Flows



Adapted from Crossan et al. (1999)

The insight to emulate the exception process was very clear. However, sharing their mental maps to explain the need for change and adapting current procedures to the desired state, required many conversations, working sessions and mutual adjustments. To even pursue this path would have required the approval of a line manager. Jack's acting supervisor role while his manager was on extended sick leave gave him the freedom and resources to develop the idea into a full fledge proposal and provided direct access to the next level of leadership. The second solid blue arrow shows the link between the group and organizational levels through the institutionalizing process. Institutionalization required the support of the corporate gatekeeper since the decision to outsource the management of the pallets was a corporate mandate. Jack

used his Green Belt project as a context to build the case and make the proposal. He leveraged the support of his team, the credibility of the method, and the documented performance of the exception process to obtain permission to run a pilot. This collaborative process included the endorsement of existing suppliers who could share their painful experience and marked preference for a change. The institutionalizing process occurred over time. Results of the pilot showed potential for sustained financial improvement and the corporate gate keeper agreed to a permanent change in procedures.

The solid green arrows show the feedback loops from the organizational level back to the group and individual levels as the new process replaced the old. The change extended from one team to all shifts. The new process satisfied the corporate need for hard savings and simplified the tasks of the material handlers (with fewer touch points). And while new teams gladly adjusted to the change, Jack's Green Belt team began to tackle the next set of improvements (B). This next set of ideas followed a similar feed forward and feed back learning flow, only faster. The team grew to trust the process, their ability to problem-solve and the willingness of the leadership team to listen and take timely action. They became bolder and made more requests. Jack built on this learning momentum, the success and credibility of the first improvement and his new network of relationships with suppliers and corporate gate keepers to get approved and move forward with implementation. Jack also expanded his dashboards to document and communicate additional benefits and hard savings from their continued efforts. The successful institutionalization and the adoption of the feedback flow (B) spurred a third round of process improvements (C) to address the remaining concerns of the working team.

This case illustrates how the 4I processes works over time and indicates how some processes of team leadership, in addition to managing the stock and flows of knowledge, can help generate and sustain a virtuous tension between exploring new ways and maintaining the integrity of functional existing processes. In this case, employees at each level of the organization benefitted. At the individual level, the project leader not only earned certification but also saw the payoff for his personal investment. At the group level, both internal and external pallet supplier teams were empowered by their participation in effecting sustainable positive change in their daily work processes. Finally, the organizational level also benefitted from the documentation of more current knowledge in a sharable format, a simplified and more efficient process, and an annual stream of productivity savings.

The 4I model of organizational learning gives us rich insights into the role of frontline leaders in iBPI initiatives and into the processes of achieving productivity and organizational learning results. Frontline leaders work with exacting details and provide a level of granularity in analyses that may not be visible at higher levels of formal authority. Frontline iBPI project leadership can also create deep engagement. This deep engagement serves as an environment that builds a deep level of support at the lowest levels of the organization and creates the micro-conditions to generate commitment, enthusiasm, and skill transfer for successive rounds of improvement.

IV.III Case 3: The Solo Learner

IV.III.i Project Leader: Darren. Darren, a long-time employee of CPG Canada, was selected by the director of the cheese department to attend Green Belt training. Though his full-time job as a plant mechanic focuses on maintenance and repairs, Darren accepted the

opportunity to attend the fourth wave of training and lead an improvement project as another problem-solving challenge. “Perry [director] offered me the opportunity. I accepted. I think it was a vote of confidence.” As part of his improvement project, Darren could now spend some of his 12-hour shift on loan to the cheese department, one of the top profit centers of the plant.

IV.III.ii Project focus. When Darren began his training, he was assigned to “help reduce machine downtime and repair interventions” in the cheese department. Even though the assignment seemed a perfect fit for his skills, Perry (the department head) and Cindy (the assistant department head) quickly realized that this assignment was too broadly defined. In an effort to leverage the experience of Len, the external process improvement consultant working in the department, Darren was assigned a smaller project, which dovetailed into the massive productivity initiative for which Len was responsible. While Len continued working on all sources of variation on the production line to achieve 3 sigma, i.e., 99.99% production run effectiveness, Darren would focus on time and costs associated with changeovers between production runs.

IV.III.iii Green Belt project outcomes. Darren worked on his project for eight months. His final project intervention came shortly after Len left the department, having carried out his mandate and successfully tested the line’s 3-sigma capability. Darren is now Green Belt certified. He looks back fondly at his opportunity to get involved and improve processes: “I really loved doing this. I even did a few side projects.” But he is skeptical that his intervention has had a lasting effect. “I am no longer in the department and I don’t know if they are still using what I did. I mean, I know they learned something …, but I know for a fact they are not weighing the barrels [of cheese waste] anymore.”

IV.III.iv Transition to organizational learning. Darren's case illustrates how iBPI projects can attain process improvement milestones and yet fail to deliver on productivity expectations. Reviewing the case through the lenses of the 4I model of organizational learning enables insight into the contribution of a learning orientation to evaluating iBPI projects as they unfold over time.

IV.III.v Case 3: Feed Forward

Darren's project was closed abruptly. In spite of a successful pilot of the new changeover methods, the project was concluded short of implementation. The feed-forward transfer of learning from individuals to groups was interrupted before integration and institutionalization. Though the interruption of the feed-forward flow became apparent on the verge of implementation, a closer look through the lens of the 4I model reveals earlier process discontinuities.

IV.III.v.i Intuiting. Per his project charter, Darren's objective was to improve the changeover process with a specific focus on reducing raw materials waste. Because of the high unit cost, annual waste of raw materials on the production line exceeded $300,000. Darren does not remember anything special about his first insights, reporting that his observations were common sense. While a changeover project might be more suited to a SMED (Single-Minute Exchange of Die) or Lean approach, the DMAIC framework required Darren to complete the Define and Measure phases. This included validating the accuracy of the data collection measurement system.

Being external to the department, Darren mainly observed and asked questions. Working without an assigned team, he approached operators on the production floor, asked questions to

validate his observations, and tried to understand how the department worked. Occasionally he had the support of two or three operators assigned on a rotating basis to assist with specific data collection tasks on the N36 machine at the heart of the department. After two or three weeks with up to eight changeovers per week, Darren made two key observations.

His first insight was that the cost of waste was miscalculated and underestimated. The cost was calculated based on the volume of cheese, which was extrapolated by the weight of its containers. Darren observed that operators on the production floor always used the same weight, though there was a significant variation of weight between empty barrels. Upon weighing the barrels, Darren verified that the standard number used by floor operators overstated the weight of the barrels and therefore understated the weight of the lost cheese.

His second insight was that the floor operators accepted lost cheese as a cost of doing business, because in raw form the cheese could be recycled. The efficiency calculations showed it as a waste because it was considered an opportunity cost, but to the operators on the line, that was merely an accounting game, because they knew that unpackaged cheese could be recycled. To Darren, this way of thinking was costly. When the logic of accepting waste as a cost of doing business was extended from raw materials to work in process or finished goods, the cost of the waste was much higher. The cost of the wasted cheese was higher, but more importantly, once the cheese was packaged, any waste could no longer be recycled and had to be written off.

Darren made key recommendations that included making setting changes at the beginning of changeovers more precise and responding faster to production interruptions at the end of changeovers. The optimal settings had been precisely determined and tested by Len and

his team as part of their overall project. Darren estimated that both changes would dramatically reduce the $300,000 annual estimated changeover-related waste on the machine.

Darren experienced his intuiting process in a subtle way. He refers to his initial findings as natural outcomes of following the DMAIC method. In contrast, he became visibly animated and enthusiastic when he spoke of being given an opportunity to get engaged in making some improvements. “That is where the value is,” he said. He referred to his insights very quickly and specifically in the context of sharing them or trying to get them into practice. He wanted to move his insights beyond the intuiting process through interpreting and integrating and into institutionalizing.

While reducing time and costs of changeovers was the stated focus of the project, Darren thought the added cost of the weight variation deserved attention, too. With up to $100,000/year at stake, he decided to pursue this opportunity as well.

IV.III.v.ii Interpreting. The transition from intuiting to interpreting was marked by the documentation of the inaccurate weighing procedure. Following up on his second insight, Darren showed the variation between actual and reported weights and the cost implications. Using the company iBPI project templates, Darren summarized his findings and presented them to his cohort on the first day of his second iBPI training session. In addition to the project charter highlighting the focus on changeovers, he had also documented his measurement systems analysis findings and an overall cost estimate.

Darren presented his findings in the “green room,” which was set up as a place for the production team employees to meet daily or weekly, at the beginning or the end of production shifts. This was the place to get updated on production changes or discuss ongoing or upcoming

projects. Scattered across the walls of the green room walls were performance reports and improvement project documentation. On every wall were copies of project charters, control charts, decision rules, floor plans, or machine schematics representing the long months of detailed and focused work on Len's project.

Darren recalls when he first presented his findings to the assembled team of daytime operators and department leadership members. "It was like suddenly there was a chill in the room." After a while they began engaging and said, "Well, here's your $40,000, here." After Darren answered some clarifying questions, Cindy (the assistant department head) announced her decision to move forward.

Interpreting began as an individual activity. Then Darren shared the information with his training cohort and a sub-group of operators. Everybody agreed to the accuracy of the calculation, but these same facts held different implications for Darren and for the team members. At the end of the interpreting process, the team had an agreement about the current state and a mandate to apply the recommended changes.

IV.III.v.iii Integrating. The integrating process began with the adjustment of group behaviors to accommodate Darren's recommendations. Since the new machine settings had been tested and validated, further work could focus on changing work procedures.

For a few weeks, Darren participated in every other N436 changeover. At a rate of four practices per week, the new procedures were simple to implement. Darren not only confirmed his insights, but also was able to measure the impact of the changes. "I don't know if they were doing it when I was not around, but while I was there we did some really nice changeovers."

Then Len's project assignment was cut short. With machine settings validated to establish production capability at a 3-sigma level, the technical work was completed. In light of the very aggressive productivity savings expectations for the plant, it was becoming harder to justify the continued consulting expense.

A week after Len departed, Darren was thanked for his work and told that his project was also finished. In his words, "Ils ont dit 'Merci' et que mon projet était terminé." (In French, to thank somebody, "remercier quelqu'un," may mean "to thank someone" or "to fire someone," depending on the context.)

A few months later, eight months after starting his Green Belt training, Darren presented his project summary to the Green Belt certification panel. The process owner from the cheese department was not in attendance. Darren did not know how the process continued to perform after he left. "We improved the method of work for sure. People react faster—an operator or a mechanic—because when something goes wrong, you know what you have to do because you worked on the machine before. I am sure they do nice changeovers." However, the walls of the green room are empty, no new projects have been initiated, and the production line is down frequently enough that everyone can tell performance levels are below 3 sigma. The simple solution to Darren's project was not sustained. Once Len and Darren left the department, no advocate replaced them.

An analysis using the 4I model shows that this project had limited engagement at the group level. Darren shared his insights with the larger group and they agreed with his analysis of the numbers, but did not share his enthusiasm. For Darren, it meant moving one step closer to completing his project. For the operators, it meant additional levels of complexity and scrutiny

and it meant more and faster work with every production changeover. For their supervisors, it meant having to continuously observe and enforce new procedures that did not seem sustainable. This is not something that could be expressed directly, so it wasn't. But as Len left and there was less visibility for the project, behaviors relaxed away from the rigor of execution of the new standard operating procedures.

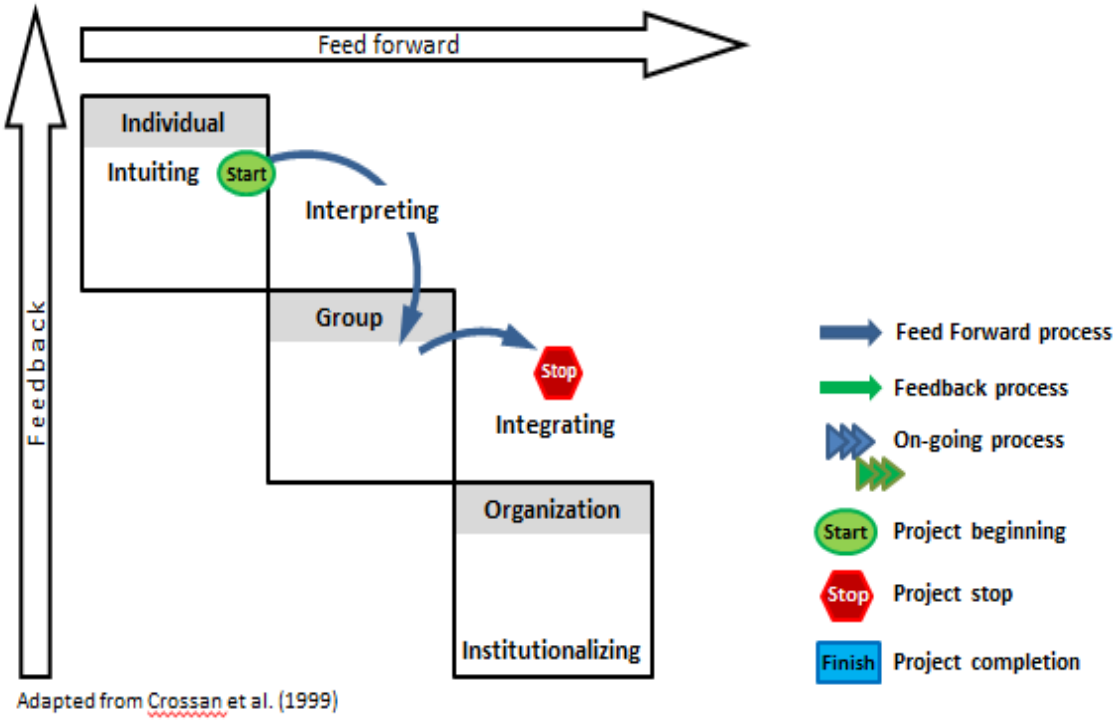
Interviews with other key informants shed some light on some of the unspoken issues. "They were happy when he [Darren and/or Len] left. It was too heavy [too much work]." Another informant confirmed, "They thought it was a project: it was going to end and then everything would be done automatically. They would just have to sit and chat. I don't mean to say that they are lazy. ... But they thought it was going to end." After Darren shared these insights during our last interview, he added, "If they did not implement his [Len's] recommendations, I don't think they implemented mine either." (Figure 6 shows how the feed-forward flow was interrupted.)

IV.III.v.iv Case 3 feedback loops. No feedback loops resulted from this project. On the one hand, this outcome is to be expected, since institutionalization did not occur. On the other hand, closer scrutiny of the causes of discontinuity in the integration phase could have yielded valuable insights. After all, the ability to execute changeovers efficiently is critical for a plant with 48 lines producing over 600 stock-keeping units (SKUs).

IV.III.vi Case 3 summary. Figure 6 shows the learning flow of this case through the integration process where the project stalled. Falling short of successful integration or institutionalization, the learning flow remained dependent upon the presence of the project leader. Intuiting followed a sustained project effort to gather information about the problem.

Committed to succeed, even as an outsider to the Cheese processing department, Darren followed the Green Belt project protocol and asked the many questions articulating the Define and Measure phases. The feed forward flow follows the path of Intuiting through integrating.

Figure 6: Case 3 - Feed-Forward Flow Interrupted



In Darren's case this Green Belt project is mostly an individual effort, until he shares his interpretation at the departmental group meeting. By then, he has a strongly supported idea of the cause of the problem and proposes a clear solution to the group level gatekeeper. The solution satisfies the financial requirements of the project so the official and public venue, forces an approval which lacks the engaged support of true commitment. Line employees working on days scheduled for the pilot follow suit and change procedures with little care or interest. Moving

swiftly to pilot means using the proposed solution as-is, without the benefit of gathering or incorporating the operators' preferences in the "how-to". The solution to-be piloted is perceived like other corporate dictates as a "fait accompli" to either accept or actively avoid. Despite promising and tangible savings during pilots, procedural changes are not sustained. The forward flow of learning fails to stabilize and even appears to recede occasionally, as though there is no shared understanding. On days when Darren works in a different department, line employees revert back to their previous process even during the pilot period. When the focal point of senior leadership team shifts to another department the group level gatekeeper formally withdraws her support. She informs Darren that his job is complete and that his project leader services are no longer needed. Without the benefit of team support or gatekeeper backing, even changes that occurred sporadically, disappeared altogether.

Overall, Darren's case highlights the importance of each stage of the organizational learning process. The short-term compliance that Darren observed during the beginning of the integration phase may have been related to the light and intermittent group-level engagement during the interpreting process. Also, differences in how organizational learning developed within each of the 4I processes and how transitions occurred from one process to the next could yield some valuable insight into project leadership and why some process improvement ideas proceed through institutionalization to the feedback flow while others do not.

IV.IV Case 4: The Solo Knower

IV.IV.i Project Leader: Jay. Jay is a quiet, focused, and busy technical supervisor at CPG Canada. Though his full-time job is primarily focused on maintenance and repairs, he took the nomination for the Green Belt training program in stride. After all, he had worked on other

improvement projects in the course of his maintenance career. Over the next few months, Jay split his time between his Green Belt training, his Green Belt project, and his full-time job. “As a supervisor, your agenda is pretty rock and roll. I mean, you have to find time between meetings. And two other supervisors had left, so I was covering three jobs. It was not easy.”

IV.IV.ii Project focus. A month after starting his first Green Belt training session, Jay received his first project assignment from Laurent, the plant continuous improvement manager. It was a downtime reduction project located at the plant’s central palletization facility. Jay spent the following month carving out time in his schedule to try to build a team and collect diagnostic data. Despite repeated attempts, his efforts remained fruitless. Following up on his project update from his final training session, he met with Jacques, his Black Belt coach. Jacques recalls the meeting: “He was very concerned [about his first project]. So, then I said, ‘Why don't you do this?’ And then he was so relieved.”

The second project assigned to Jay consisted of decreasing costs caused by volume fluctuation in filling machines on the B12 production line in the sauces department. Jacques, the Black Belt, had just completed a similar project as part of a much bigger initiative involving the entire production line. He guaranteed the availability of data, the entire project protocol, and even the actual outcome. This was a sure way of completing the project, delivering the bottom-line savings, and getting Green Belt certified. The project was on the upcoming list of the department’s productivity improvement priorities and the operators could see the completed example on the nearby production line. Also, it would require less time from their already busy schedules. So what could possibly go wrong?

IV.IV.iii Green Belt project outcomes. Jay's solution was implemented about 18 months later. Looking back at his 36-month certification journey, Jay reflected on what he learned and how it was applied. "The solution delivered about 60% less than we thought, but it still turns out to be about $26,000 to $30,000 a year, every year. It looks like a small amount, but that's what I learned. With the kind of volume we have around here, small amounts like one mil here and there can add up to a lot. And that is something that has changed. That was a cultural change we all went through. Now we see project opportunities that we would not have seen before. And if you do that everywhere, then that adds up to a lot of money."

Unbeknown to Jay, his solution's programming change was deactivated. It's hard to tell precisely when it happened. But Henry, the new Black Belt in change of the line, found out by chance. He was then told that the programming was faulty. Henry trouble-shot the programming and made the subtle requested changes and reinstated the control loop change. But three days later, it was deactivated again. And so it remained as of our last interview.

IV.IV.iv Transition to organizational learning. While Jay was exploring a new process improvement method, he was exploiting the outcome of Jacques' overfill project. Reviewing the case through the lenses of the 4I model of organizational learning illustrates the relationship between the feed-forward and the feedback flows and gives us a deeper understanding into the boundary conditions of how feedback unfolded through to the group and individual levels.

IV.IV.v Case 4: Feed Forward. The feed-forward process began with the assignment of the first project. Despite his prior problem-solving experience, Jay was new to the palletization area and new to Lean Six Sigma. As he began the Define and Measure phases of his project, he felt very much the mix of excitement and uncertainty of launching the program. The poster-

sized, autographed picture of the first cohort still hangs in the training room. In the middle of the picture, a very evocative drawing of a pair of gloved hands holding a pickaxe and protruding from a mound of dirt bears their name: “Green Belt Pioneers.”

IV.IV.v.i Intuiting. Jay spoke of these early months in metaphors. “We broke the ice.” And that is telling in the midst of extreme Canadian winter weather. This metaphor refers to setting the program in motion. However, like the early sailors who gave us this metaphor by stepping out to physically break the ice holding the boats close to shore, this metaphor is also descriptive of the early months of trying to find traction and create forward motion in an environment that would change from rigid to shifting unpredictably.

The concerns of the Green Belts participants ranged from the newness and high visibility of the program, balancing full-time work responsibilities, the handicap of starting the program without a project, and falling behind the others in the cohort. Now even with a project assigned, the frustrating inability to collect data seemed insurmountable to Jay when we talked during the project updates of the third training session. “I can’t estimate savings for the business case, or even collect data to confirm the size of the opportunity. And if we cannot even verify these estimates, then how am I going to be responsible for delivering these savings, if we don't even know if those are real numbers? And how am I even going to do that, if I cannot even collect data? I have a full-time job, and the current process is so manual that there is no way I can collect data automatically. I tried with the operators on the floor, but it took a long time, I did not get a lot of data, and I have no way of validating the accuracy of the measurement system. And you say that I have to do that to get certified, that I have to save an average of $50,000?”

When these questions came up during the project updates of the third training session, Jay asked for help. By our final interview 36 months later, Jay no longer mentioned his first project: “It’s been a while.”

But Jacques, his Black Belt coach, still remembers clearly the conversation that led to the change of project. “I realized that his initial project was too complex and too big. He was pretty exposed. He had little support …. No one had done this project before. The project was imposed on him. He had no choice. The project was pretty vague, ill-defined. Had he kept this project, he would have never finished. I had this project I had just done. It was done. It was easy. I had the pattern for him and I could help him do it. He was so, so happy to be out of an impossible project and being given a project that would work. His level of anxiety on his project went from 100% to 10%. That was the key moment of his project.”

After this conversation, with answers in hand and reassured by the supportive engagement of his Black Belt, Jay could relax into following the project protocol. Using the DMAIC tools to replicate the project protocol and eliminate technical parameters from the sources of variation took less than a month.

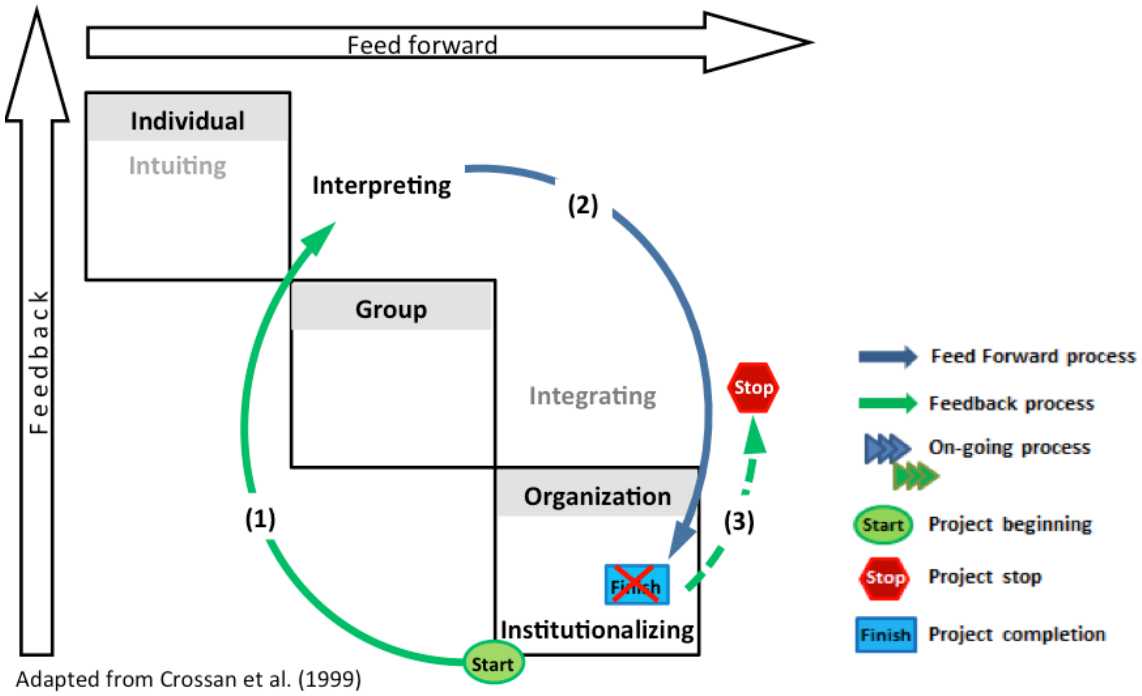
As expected from looking at the project that Jacques led, the weight fluctuations were not related to volume, density, speed, or any of the machine-controlled parameters. They were caused by human manipulations. Two weeks later, the control loop—i.e., the programming solution designed to eliminate the variation of these human manipulations—was ready to implement.

Jay, who is a disciplined Green Belt, applied the DMAIC tools rigorously. Even months later, he speaks of carrying out the Measure and Analysis work with the ease of a long-term iBPI

practitioner. “We pulled all the variables, for the machines, the density system, everything to make sure they did not introduce any variation in our control loop. We could confirm that the filler or the scale or the product density—our key variables—were not the source of variation. So we looked at anything that could contribute noise into the measurement and knew it was not due to the equipment. That was stable. Then we did some measurement analysis studies to understand the measurement variation between different shifts, between different operators, between filler heads. So we knew what was left was to remove the operational variation.”

IV.IV.vi Case 4 summary. Figure 7 shows the learning flow of this fourth case. The project began with the feedback flow (1) from a previously institutionalized project and proceeds through the individual level back to organizational level institutionalization-like activities (2). The changes are unstable and eventually result into a return to the status quo (3). In bypassing the individual and group learning processes in favor of a learned response and a forced institutionalization process, Jay failed to build the foundation for successful change. This case provides deep insights into the elements that are necessary to create the kind of vibrant and dynamic feedback loops that lead to successful feed forward learning flows.

Figure 7: Case 4, Phase 1 - Feedback Flow and Unstable Institutionalization



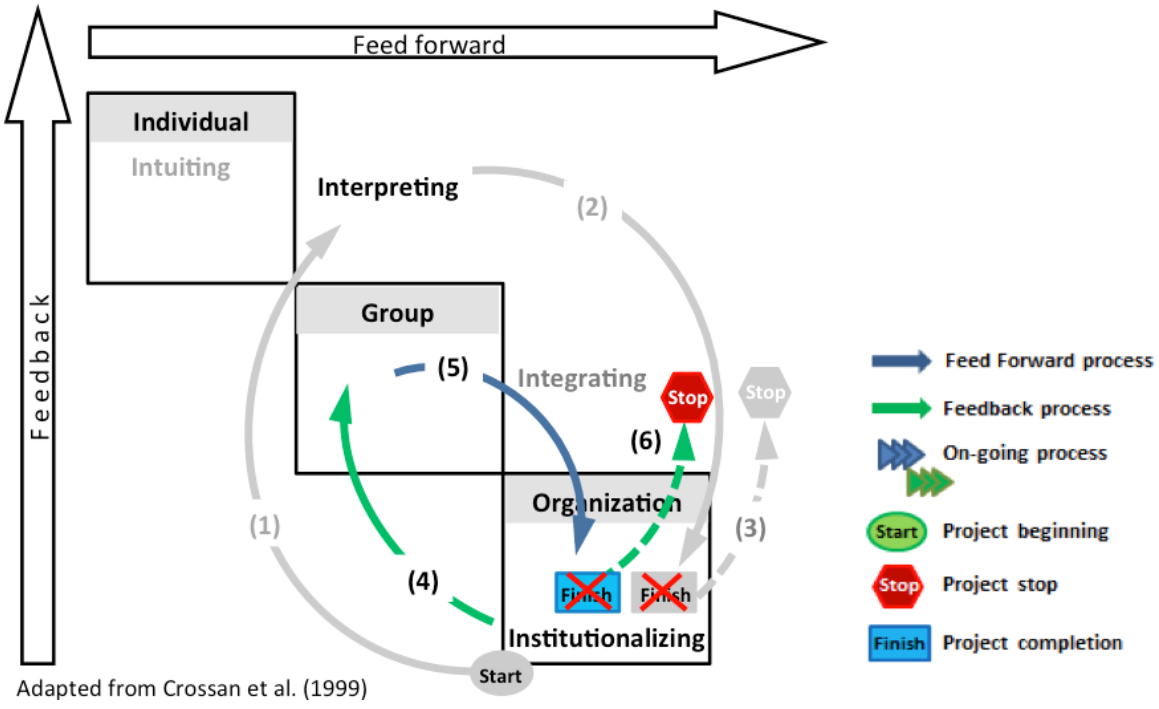
Adapted from Crossan et al. (1999)

Under Jacques' tutelage, the replication of the project deliverables proceeded with expert efficiency and without surprises, good or bad. During the six weeks that elapsed from problem definition to solution, there were no "light bulb" moments that Jay recalled. The discovery phase, i.e., Define and Measure, which helps jump-start the intuiting process by identifying contrasting areas of performance, began with the first project before any significant insight emerged. For the second project, Jay was relieved of the anxiety of figuring out how to apply DMAIC or find a solution, so he could focus on exploiting Jacques' proven solution and carve out enough time to tend to the activities of his full-time job. The perception of success and enforceable change leads Jay to the conclusion that the project is finished and to stop project related activities. The

corresponding lack of follow-up causes the alteration in the programming to go unnoticed for a long time. Figure 8 shows the second unstable attempt at institutionalization.

When Henry studies the line, learns about the improvement project (4) and eventually discovers the deliberate change he asks the work team why it was changed and left unreported. Addressing the reported technical gap in performance (5) Henry modifies the programming once again. There is a high level dialogue but not mutual understanding, interpretation or agreement. There is high level consultation but not willing integration since two days later the programming change is deactivated once again. Without team support or active gate keeper sponsorship Henry stops as well and the feed forward learning flow recedes back (6) from the organizational level.

Figure 8: Case 4, Phase 2 - Another Case of Unstable Institutionalization



Adapted from Crossan et al. (1999)

In case 4, knowing the answer was not sufficient to lead to group or organizational learning. Neither did it produce sustained change and ongoing benefits. The organization failed to capture the learning from the successful pilot of initial project leader (Jacques). The short-term focus on institutionalization also prevented discovery and learning from the failure to enact and sustain changes. Failing to learn how to institutionalize learning, the social and psychological organizational learning process served to replicate the flaw (Jay and Henry), learning how to institutionalize failure. This case reveals feed back flows to be an important foundation for ongoing organizational learning, complex beyond mere consultation and replication.

DISCUSSION

This research study draws from the dual objectives of engaged scholarship to contribute to both knowledge and practice. Acknowledging the impact of the DMAIC context on the organizational learning process, I review the contribution of this study to the practice of organizational learning in iBPI. Next, I review the contribution to the theoretical framework, by contrasting results from four cases of iBPI project leadership as analyzed through the lenses of the 4I model.

Using the analogy of a tree, Crossan et al. (2011:451) caution us to avoid creating additional complexity and further fragmentation of the field of organizational learning. Instead of additional leaves, they invite contributions to new branches, such as the role of leadership as it relates to the 4I processes and the role of power, politics, and emotion in organizational learning. These branches would extend a theory of organizational learning to include how employees relate to structures that locate them in positions of inequality or impotence and to account for the role of leadership and followership beyond an upper echelon perspective. Further, Crossan et al. recommend extending our theories of organizational learning to include a focus on practice and activities in the foreground to explore learning within levels and across levels "like an accordion, in which we can compress the levels placing the practice or activity in the foreground of theorizing and the levels in the background. Or we can expand the levels and expose the multilevel relationships that hold the practice in place" (2011:454).

To serve our dual purpose of engaged scholarship we follow these recommendations and first expand the accordion of iBPI practice to unpack 4I learning processes and reveal connecting threads to the aforementioned branches and leaves. The theoretical lens of the 4I model allows us

to see connections that might have remained hidden. The comparative case analysis provides rich insight into enablers and barriers to organizational learning in iBPI and forms the basis of our contribution to the practice of organizational learning in iBPI.

Compressing the accordion back into the 4I's we use the context of iBPI practice to contribute to the theoretical framework. The understudied viewpoint of organizational learning originating from frontline employees, offers a complementary perspective to understand why and how some ideas become institutionalized when others do not. Frontline leadership emerges as a significant factor in facilitating the multilevel relationships which hold the practice in place, and forms the basis of our contribution to the 4I model of organizational learning.

V.I Contribution to the Practice of Organizational Learning in iBPI

A disciplined improvisation distinguishes the first two project leadership processes. They followed the DMAIC methodology until the Control phase and forged a path through institutionalization and feedback to organizational learning. Using a collaborative approach to leading iBPI projects, they leveraged team and organizational, formal and informal, resources. In addition to gathering great project data, these engaged project teams provided partnership in generating insights, testing understanding, developing shared cognitive maps, and integrating the solution. The collaborative aspect extended to close working partnerships with project champions and other key stakeholders who controlled the formal approval and resource allocation processes. This scope was sufficient to complete the projects and meet GREEN BELT certification requirements. Beyond this scope, Green Belts successful at organizational learning continued to lead in creating awareness of the benefits and commitment to widespread solution implementation.

V.I.i Organizational Learning Facilitators in iBPI

V.I.i.i DMAIC intuiting and interpreting processes. The DMAIC methodology is designed to generate process improvements by guiding Green Belts and their teams through a logical sequence of steps. Within each DMAIC phase (Table 1), the toolkit is organized to focus the Green Belts on a relevant business problem, identify knowledge gaps, and prime the teams to generate and evaluate answers. This systematic approach focuses the learning experiences and causes knowledge gaps to arise progressively throughout DMAIC. In response, so do the intuiting and interpreting processes. Specifically, knowledge gaps and insights arise in the Define phase (scoping out the project), the Measure phase (scoping out the problem and collecting potential root-cause data), the Analyze phase (identifying root causes of defects and separating the "trivial many" causes from the "vital few"), the Improve phase (developing a solution), and the Control phase (helping maintain the solution).

To complete a DMAIC phase and move to the next one, the project leader and the team must provide explicit answers to the questions that arise from each gap. If the answer is known, it is documented and verified with data; it then becomes the foundation for the next stage of the process. If the known answer proves to be erroneous or if the team does not know the answer, they continue to seek an explanation. Potential answers are then tested empirically to ensure a stable foundation for the next analysis level. While the original 4I model does not specifically identify steps between the interpreting and integrating processes, we observe that only some of the interpreted insights are fed forward in the learning process. The DMAIC process sheds some light on how the evolutionary selection process plays out. After brainstorming, the Green Belt

needs to explain the relationship between the insight and the knowledge gap in order to carry the insight forward in the DMAIC process. At the individual level, this selection process can manifest through insights that may not be interpreted or shared because the Green Belt believes that others will not accept them.

V.I.i.ii DMAIC testing and experimenting, and reaching stability processes. The DMAIC process illustrates how this evolutionary process develops. Analysis uses a data-driven approach to guide project leaders to rely on logic rather than gut feelings. Evidence of these short-lived insights and of the testing and experimenting subprocesses at the individual level became apparent when I interviewed the project leaders or compared iterations of the project documentation. Some insights survived the testing and experimenting processes while others were abandoned. The process of accumulating and developing individual knowledge involved a series of iterations of intuiting, interpreting, and testing for validity or usefulness. In addition to insight selection, the testing and experimenting processes validate the Green Belt's insight as legitimate. This legitimacy makes the Green Belt more confident in moving forward to share the insight with the group or with someone in formal authority. This is the process that Jack (case 2) went through when he submitted his idea and requested permission from the continuous improvement manager to pursue it as a Green Belt project.

Our case data shows that insights that developed individually and that withstood scrutiny became legitimized and shared with the group even when they contradicted the mental models of the group. Clyde (Case 1) shared his finding about the lack of relevance of speed and throughput with his team, even though it contradicted the expert assessment. The performance data he had collected helped him make this conclusion and facilitated a follow-up conversation about what

additional variables could cause the problem. Jack (Case 2) was more confident in sharing his insight about the improvement opportunity with his team once he had confirmed its authorization and the size of the financial opportunity.

Finally, the testing and experimenting processes led to stabilization of the insight into knowledge, which proves useful if the insight is challenged at the group level or if the next logical insight is found untrue (Case 1). Empirical data shows that, guided by DMAIC, an insight goes through a process of emergence (intuiting process), interpretation (interpreting process), and testing for validity (testing process). Depending on how well the insight survives validity tests, it is either abandoned or stabilized enough to become a foundation for the next stage of the improvement process, where its legitimacy makes it accepted as knowledge. In cases 3 and 4, where the Green Belt project leaders worked independently, the DMAIC learning remained individual (Table 7). In cases 1 and 2, the project leaders and the teams learned from the successive DMAIC phases, integrating and stabilizing each phase's learning to build and implement a robust solution.

Table 7: Green Belt Project Leader Learning

Green Belt Project Leader Learning/Practice	Case 1	Case 2	Case 3	Case 4
Understand process under scrutiny	✓	✓	✓	✓
Practice technical side of the DMAIC methodology with its many tools	✓	✓	✓	✓
Facilitate change within a team	✓	✓		
Engage key stakeholders	✓	✓		
Adapt when obstacles obscured the prescribed path	✓	✓		

V.I.i.iii DMAIC toolkit. The DMAIC methodology includes tools within each phase to prime the intuiting process through activities ranging from observation, qualitative inquiry, and team brainstorming to more quantitative benchmarking, data displays, or data analysis to reveal unrecognized patterns. Unexpected, nonrandom patterns in the Measure or Analysis phase usually indicate a new potential causal link worth investigating. If the insight about that causal link can be interpreted, explained logically, and verified with data, it is then legitimized, accepted and incorporated in the project. Because DMAIC requires ongoing documentation, project leaders make their understanding of these insights explicit through the interpreting process. Documentation of free-flow brainstorming allows the Green Belt to acknowledge and document insights that he or she might not yet be able to interpret. As understanding progresses, so does the interpreting process. Iterations of the required documentation updates allowed us to trace the feed-forward progression of several insights emerging over time.

V.I.i.iv Parallel meso-structure and learning environment. The iBPI parallel meso-structure that sets Six Sigma apart from other process improvement methods provides an alternative structure (Schroeder et al., 2008) that allows Green Belts to leverage an alternate formal structure to obtain the support and resources required to challenge the status quo (Cases 1 and 2) and complete their projects. Further, the training approach and the coaching support of BBs and MBBs provide a learning environment that promotes enquiry into new ways of working. When this learning environment extends to the project teams using DMAIC to design and explore new solutions, it leads to group learning. In cases of organizational learning (cases 1 and 2), the learning environment further extends to include the decision makers.

V.I.ii Organizational Learning Inhibitors in iBPI

V.I.ii.i DMAIC toolkit and structure. Looking through the lens of the 4I model, DMAIC emerges as a purposeful, systematic sequence to stimulate intuiting, motivate interpreting and facilitate integrating. The sequence repeats through each phase and culminates in documenting performance indicators and process control mechanisms in the Control phase. At that stage, the Green Belt has learned how to lead an iBPI project through DMAIC, and the team has learned about the process under improvement. In case the organization decides not to pursue the recommended action (Case 3) the experience of learning and the documentation remains. In cases where the solution is implemented (Case 4), the organization reaps the additional benefit of the tangible improvement. In either case, the DMAIC process is complete. Even when the project documentation is accessible companywide, there is no further mechanism to facilitate learning or application at the organizational level. Green Belts return to their full-time, day-to-day responsibilities, BBs are reallocated to other projects and learning remains at the individual and group levels.

Project leaders in cases 1 and 2 led beyond the completion of their DMAIC deliverables. They leveraged the parallel meso-structure (Schroeder et al.,1998) by deliberately focusing on having their solution institutionalized at the organizational level. This manifested as longer project cycle times (from 6 to 24 months) and sometimes additional iterations or "three mini projects."

V.I.ii.ii Metrics. Through project success metrics such as "project cycle time," Cases 3 and 4 looked more successful. Through these same lenses, process steps used by project leaders in cases 1 and 2 looked like they were non value added because they deviated from the familiar

DMAIC toolkit. The extent of the organizational learning contribution of Cases 1 and 2 through the institutionalization and the feedback processes were revealed by 4I lenses. The rich structure, rigor and resource allocation and shared mental models that make DMAIC so successful at generating individual and group learning is lacking between the group and organizational levels. In this way, the program design becomes a barrier to organizational learning. The lack of processes to facilitate the transition to the organizational level and the feedback process of organizational learning, and the perception that DMAIC is sufficient, cause resources to be reallocated and stops the learning process. Further, since there is no longer any context for their continued efforts, project leaders either become invisible (Case 2) or must contend with open derision of their motives (Case 1). These factors may explain why there are so few examples of organizational learning originating from frontline iBPI projects.

V.I.iii Discussion. Based on these empirical findings, the role of the frontline iBPI project leader in organizational learning appears to be more expansive than is currently prescribed by the DMAIC methodology and more complex than is described by the 4I model. Consequently, though DMAIC contributes significantly to organizational learning, in its current configuration, it poses several barriers to frontline project leadership success. The imbalance caused by an overemphasis on feed forward and a limited feedback flow, make the program very inefficient. Further, the project scope includes the individual and group levels only, precluding institutionalization save for some very enterprising and persistent project leaders. Finally, the productivity mandates for program deployment demand that results be achieved so quickly that they may jeopardize the learning process necessary for organizational learning. Part-time project leaders and their teams will be encouraged to "just do," which ultimately stops the continuous

improvement loop. In failing to institutionalize a path to organizational learning, we might be institutionalizing a path to project failure.

Fortunately, the theoretical lenses of the 4I model give us some insight into the frontline leader's role in facilitating organizational learning in iBPI. This learning and influencing role at the organizational level clarifies the role of senior leaders in creating an iBPI project deployment structure that allows them to do so.

V.II Contribution to the 4I Model of Organizational Learning

The 4I model is positioned to explain how organizations achieve strategic renewal so they remain competitive despite a changing environment. In this context, organizational actors must decide which knowledge to develop, which knowledge to acquire, and which knowledge to use. Like all innovative processes, organizational learning is inefficient and nonlinear, and the failure rate is high. Organizations are not the only ones facing this trade-off. Individuals do as well. And while ideas abound and insights arise in an instant, the harder work begins after ideas and insights are generated. What distinguishes our project leaders is that they are willing to work hard and stay the course until learning and process improvement results ensue. From studying their practice of project leadership in iBPI, we derive a stronger theoretical understanding of the process and the role of project leadership in organizational learning in iBPI .

This study shows that the 4I model of organizational learning describes many of the salient features of our two success stories, cases1 and 2. In cases of failure, we identify important differences in execution, such as the lack of group engagement in cases 3 and 4. The contrasts between successful and unsuccessful examples of organizational learning emphasize the importance of key premises of the 4I model, such as the flow of learning across all three levels.

Following the practice of leadership in organizational learning in iBPI yields additional insights. At the finer level of granularity of our data collection and analysis, the process of leadership of our first two project leaders includes additional sub-processes not identified in the 4I framework. Using that level of granularity, collected as the projects developed over time, we analyze the differences in these sub-processes to assess how and how much they affected the flows and outcomes of the organizational learning process.

Based on these empirical results, the role of the frontline iBPI project leader in organizational learning appears to be more expansive than currently prescribed by the DMAIC methodology and more complex than described by the 4I model. To understand the significance of these differences, we contrast the similarities between the project leadership processes in the two successful cases of organizational learning with the two remaining cases. The comparative analysis becomes our basis for developing the role of the frontline leadership process, and for discussing practical implications for iBPI leaders.

V.II.i Nuancing the 4I Model: Subprocesses

V.II.i.i Feed forward: intuiting and integrating. In addition to finding support for the original 4I and for the Attending and Experimenting action based learning processes, we find that expanded applications of existing constructs and new constructs emerged, to explain patterns of events (Table 8) that existing constructs did not describe. For example, the 4I literature identifies two ways in which individuals intuit. Crossan et al. (1999) distinguish between the pattern recognition of experts and the search for new connections, which they describe to be more entrepreneurial. Throughout the cases, we find instances of expert pattern recognition and creation of new connections. However, many key project insights emerged when expert pattern

recognition failed and the experts had to create new connections to reconcile the appearance of the pattern with the data collected. Because Green Belts lead iBPI projects related to their full-time jobs, they become familiar with many of the patterns. Over time, they take them for granted. The DMAIC process tools guide project leaders in identifying expert patterns related to their projects, in making them explicit by documenting the expected relationships, and in collecting data to validate these relationships. This is what happened with Clyde's first insight. He created his project charter, mapped the flow of the product through the machine, and collected data to confirm the maintenance pattern he recognized, i.e., that excessive parts failure and downtime in a piece of equipment were caused by speed settings and/or throughput levels beyond the capacity of the equipment. However, the performance data showed no relationships among speed, throughput, and machine downtime, so Clyde sought new connections. The failure of his expertise revealed a knowledge gap; the next step was to close this gap. The knowledge gap, the need to move forward with the project, and the tools of DMAIC created a context for new insights to emerge.

We also elaborate on the current understanding of *Attending.* We describe *Attending* as an action-based learning process initiated by the awareness and the need to resolve a knowledge gap. We found instances of *Attending* and Experimenting occurring at the individual level.

Table 8: 4I Extended Constructs Definition - Individual

4I Constructs (Individual)	4I Literature Says	iBPI Study Finds
Attending (A)	Active process of information seeking from the environment Zietsma et al. (2002)	Active process of creating knowledge gaps and seeking divergent data from the environment to prompt intuiting, facilitated by DMAIC
Intuiting (I-1):	Pre-verbal, subconscious process Arises through pattern recognition (expert) or establishing new connections (entrepreneurial) Crossan et al. (1999)	Pre-verbal, subconscious process primed by attending to DMAIC knowledge gaps Occurs when experts are forced to establish new connections to explain a pattern they do not recognize
Interpreting (I-2):	Explaining through words and or action, of an insight, or idea to one's self and other Crossan et al. (1999)	✓ Facilitated by DMAIC
Testing (I-3)	N/A	Affective component of the evidence-based evolutionary selection process of insights by which legitimacy is validated
Experimenting (E)	Active cognitive process of testing and developing interpretations. Signals the transition from individuals to groups Zietsma et al. (2002)	Active cognitive process of testing and developing interpretations. Individual or group level process facilitated by DMAIC Cognitive component of the evidence-based evolutionary selection process of insights by which legitimacy is validated or justified
Stabilizing (I-4)	N/A	Process by which insights are integrated into individual mental models as legitimate knowledge, facilitated by DMAIC

We introduce *Testing*, which complements Experimenting in validating and developing interpretations and screening solutions. While the literature defines Experimenting as a cognitive, deliberate and mostly rational process, *Testing* accounts for the affective and subconscious evaluation processes revealed in our data. We also introduce, *Stabilizing* which is the process by which an insight or a solution is integrated into mental models as legitimate knowledge. The stabilization process matters because it allows project leaders to use the information as a stable foundation from which to place the next building block of the solution or from which to formulate the new iteration of the group level interpretation.

Table 9: 4I Extended Constructs - Individual Level Cross-case

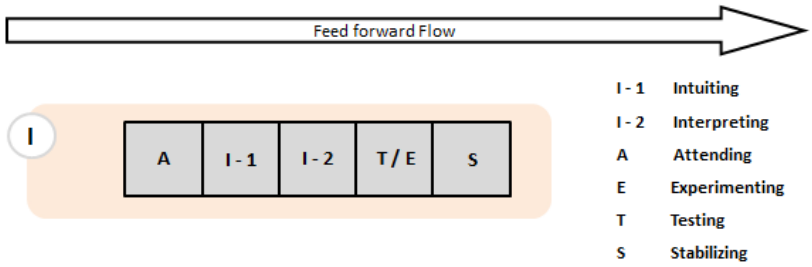
4I Processes: Individual Level	Case 1	Case 2	Case 3	Case 4
Attending	✓	✓	✓	✓
Intuiting	✓	✓	✓	
Interpreting	✓	✓	✓	
Testing / Experimenting	✓	✓	✓	✓
Stabilizing	✓	✓	✓	

Comparing across cases, we find that Green Belt project leaders from cases 1, 2 and 3 experienced the full sequence of individual learning processes, while the Green Belt from case 4 who reported that "it was almost too fast for me to learn" bypassed the Intuiting and Interpreting stages. Though experimentation occurred to validate the application of the existing project protocol, there was little stabilization of the learning. This supports our operational definition that *Attending* prompts the intuiting process in the context of a knowledge gap. In case 4, the solution was given to Jay, "tout cuit dans la bouche" or "fully cooked, ready to eat and delivered in his mouth" to use the local vernacular. There was still the need to complete the project but no DMAIC knowledge gaps to close, which enabled him to complete project tasks with speed and accuracy and with limited learning.

Empirical data from cases 1 through 3 supports the following set of constructs for individual learning processes (Figure 9). Cases 1, 2 and 3 show examples of intuiting (I-1) and interpreting (I-2), unlike case 4 since Jay did not go through the intuiting process. Both patterns are consistent with the 4i model and explain the different outcomes in individual learning. However the 4I learning processes are not sufficient to explain the difference in organizational learning between cases 1 and 2 and case 3 (Table 9). This apparent lack of discrimination

through the 4I lenses suggests that additional processes account for the difference in organizational learning outcomes. It also suggests that individual learning might be required but not sufficient to unfold into organizational learning.

Figure 9: 4I Extended Constructs - Individual Level



V.II.i.ii Feed forward: interpreting and integrating. Interpreting (I – 2) and Integrating (I – 3) are presented as group level learning processes in the original 4I model. Recent 4I literature is split on the topic. While Crossan et al. (1999) argue that only individuals intuit, Hansen (2012) observed that both individual and group insights occurred, and Zietsma et al. (2002) observed instances of intuiting as an individual process that is influenced by the group. We find support for each one of these propositions. Our case data (Table 10) reveals further differences between cases successful cases with a full spectrum of group level learning processes, and failed cases where only Testing, Experimenting and Integrating occurred.

An important feature of the iBPI Green Belt team process is that, by virtue of conducting project deliverables in meetings designed to facilitate team problem solving and sharing of ideas, we can observe the "aha! moments". Clyde (case 1) and Jack (Case 2) reported seeing the connection between a team member acting as a catalyst by making an observation and causing the group to intuit out loud, in close temporal proximity. As a result, we propose that intuiting is both an individual process and a group process.

As outlined in 5.1.1, the Green Belt project and DMAIC process facilitate attending, intuiting, interpreting, testing and experimenting, integrating and stabilizing. The group dynamics which instigated and accelerated the interpreting process in Cases 1 and 2 may also constrain the sharing of individual intuitions. In case 3, Darren was reluctant to share information until he had solid and proven findings. As a result of the constrained group dynamics, he engaged the group and the process owner too late in the iBPI project process.

Events unfold differently at the group level when cognitive maps are shared and interpretations tested prior to integrating. In cases where these steps were bypassed (case 3 and 4), integration was not stabilized. This pattern parallels the difference in time allocated to engage the groups during the projects. In cases 1 and 2, the team was an integral part of the problem solving process, whereas in case 3 and 4 they were brought in at experimenting to pilot a solution, decreed by the gatekeeper. In these latter cases the project leader solved the problem independently of the team. The decision saved time or allowed the pilot to move forward despite the group's reluctance. As a consequence, project leaders failed to surface preferences or address legitimate concerns which could derail integration. The group failed to learn, and the feed-forward flow was interrupted.

Table 10: 4I Extended Constructs - Group Level Cross-case

4I Processes: Group Level	Case 1	Case 2	Case 3	Case 4
Attending	✓	✓		
Intuiting	✓	✓		
Interpreting	✓	✓		
Testing / Experimenting	✓	✓	✓	✓
Integrating	✓	✓	✓	✓
Stabilizing	✓	✓		

V.II.i.iii Feed forward: integrating and institutionalizing. In the 4I model, Integrating and Institutionalizing complete the feed forward flow of organizational learning. Crossan et al. (1999) proposed that institutionalizing is the process by which routinized actions occur. "Tasks are defined, actions specified, and organizational mechanisms put in place to ensure that certain actions occur. Institutionalizing is the process of embedding learning that has occurred by individuals and groups into the organization, and it includes systems, structures, procedures, and strategy."(Crossan et al., 1999: 525). We find support for these original 4I learning processes at the organizational level, with the addition of the Testing and Experimenting, and Stabilizing learning processes introduced previously. The team developing the solution is learning on behalf of the organization at the group level in feed forward. They have the opportunity to test and experiment, and modify the solution prior to or during integration. Groups who must use a solution once it is standardized, no longer have this opportunity. Should the solution fail to meet their needs which they evaluate through the testing and evaluating process, they may comply as long as they have to. It seems that institutionalization has occurred. But change continues. Until the learning is stabilized and becomes the legitimate default (Pro in case 1), the

institutionalization process can fail (control loop in case 4). In overt cases the previous solution can be de-institutionalized to make room for the new one (case 2). When the group has not learned and shared interpretations are not developed, the solution might not perceived to be legitimate. However, when institutionalization is mandated, the group may avoid the solution in a more covert but very resilient way (case 4 control loop deactivated. Twice).

The stabilizing process is important because it sets the stage for a successful feedback loop. The multiple feed-forward and feedback examples in case 1 and 2 show that the knowledge was stabilized as it was used over time by individuals and groups who had no contact with the source of the insight. Over time, new knowledge emerged from these new applications in a sustained sequence of feed-forward and feedback loops. All three levels of the organization had learned how to learn (**Table 11**) and were actively using this capability by the end of the study period. Stabilization enabled feedback. Application of the knowledge created the context for developing new knowledge.

Table 11: 4I Extended Constructs - Organizational Level Cross-case

4I Processes: Organizational Level	Case 1	Case 2	Case 3	Case 4
Attending	✓	✓		
Intuiting	✓	✓		
Interpreting	✓	✓		
Integrating	✓	✓		
Testing / Experimenting	✓	✓		
Institutionalizing	✓	✓		✓
Stabilizing	✓	✓		

This “learn to learn” dynamic (cases 1 and 2) goes beyond tasks, actions, systems and procedures. It produces embodiment of the learning at the organizational level. In contrast, we

can link the failure to institutionalize the solutions in cases 3 and 4 to the missing group learning processes. We can also link Jay's failure to engage the group and to sustain the control loop in case 4, to the failure which was institutionalized by the project he was replicating.

V.II.ii Enhancing the 4I model: leadership roles. Theoretical studies have supported the current elaboration of the model, with the notable exception of Lawrence et al. (2005), who integrated the concepts of power and politics into the 4I model as the fuel moving organizational learning from feed forward to feedback. On the other hand, all the empirical studies have extended the model, with the notable exception of Crossan and Berdrow (2003), who offer one of the first empirical validations of the 4I model, with a 10-year retrospective case study of the transformation of the Canadian Post Corporation. Zietsma et al. (2002) and Hansen (2012) have contributed empirical evidence of additional process steps in organizational learning.

Similarly, this research study finds support for the four premises of the 4I model, which helps us understand and analyze the complex phenomena of organizational learning. The three levels and the 4I processes provide rich and deep insights into the process and the role of frontline project leadership in organizational learning in incremental business process improvement. The following contributions result from studying the cases from the perspective of frontline leaders, thereby distinguishing role dynamics and sub-processes that might be confounded in a top-down example of organizational learning.

V.II.ii.i Leveraging group and organizational gatekeepers. **Figure 10** is a model of the multilevel process of organizational learning in iBPI from a frontline leadership perspective. It builds on the display of individual level processes (Figure **9**9), to show all three levels of the organization. The model distinguishes group learning processes from individual processes with

the notable addition of the integrating process (I-3), and the individual learning process of the group level gatekeeper (GK1). Even though the decision to integrate does not have to be finalized until integrating (I-3), cases 1 and 2 show that early engagement of the group gatekeeper and participation in the group learning processes, provides a strong foundation for advocacy. The arrow demonstrates the link between the intervention of the group gatekeeper and the flow of group learning.

At the group level (G), we acknowledge the critical role played by group-level gatekeepers (GK1) who decide for the group. While we agree that the individual level is critical for organizational learning to happen, we find the individual learning process of the group level caretaker equally important for learning to move to the group level and stabilize. Failure to secure that learning early may cause the integration process to fail and ultimately stop the feed-forward process.

In iBPI the team learns as team members participate in the problem-solving cycle. Attending allows the team to look at the process under review through the same lenses as the project leader. In this context, group-level intuiting supports group-level interpreting. Shared understanding grows, expectations surface and difference can be addressed before integration begins. As behaviors begin to adjust in coherent action, group members test and experiment to validate the functionality and fit of the insight. Insights that fail the functionality test are abandoned and the learning process returns to testing another insight, if another was under consideration. Otherwise, the learning process returns to the attending process, where intuiting is primed with cognitive and visual, social, and analytical process improvement tools. If the root

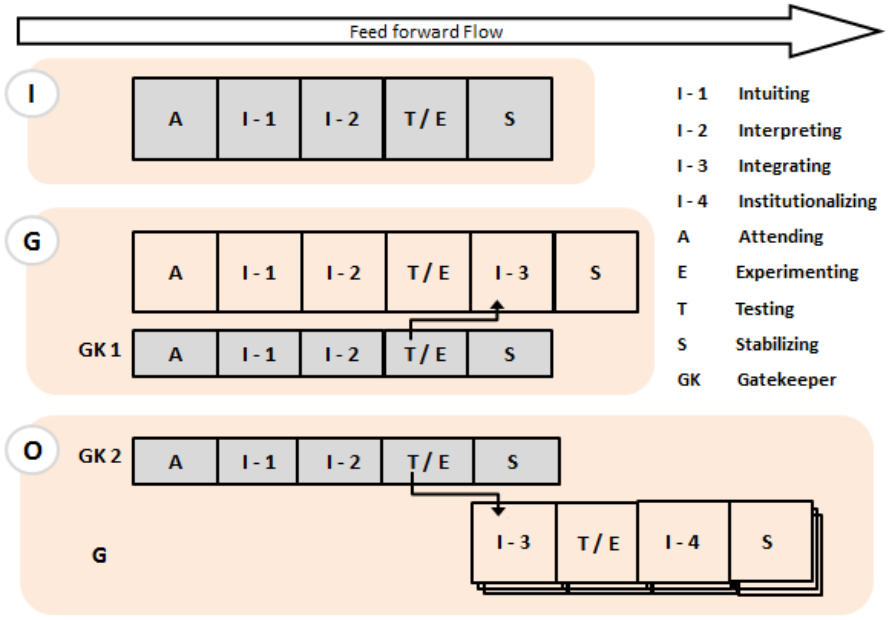
cause analysis is correct but the test of fit fails, the team may choose to continue to experiment to develop a more suitable solution.

Though power could be used to force integration, it is usually beyond the purview of a frontline project leader. Further, unless all other options were removed, it would require a sustained use of attention and power that might be difficult to allocate. Fortunately, a learning orientation in project leadership makes key stakeholders -like the group members and the group level gatekeeper- co-designers of the solution, rendering the use of power less necessary.

Stabilization matters because integration of learning takes time. Further, a leader can use hierarchical systems to compel behavior changes, but the changes might be transient. Learning becomes embodied over time and even desired changes may require a period of transition and practice before they become habits. When changes become self-sustaining, they no longer require high levels of maintenance and monitoring from formal authority. Removing these authority structures too early can jeopardize success and the ability to proceed to the next level of organizational learning.

V.II.ii.ii Organizational level in OL in iBPI. In our study, we find that the transition to the organizational level occurs only when an organizational-level gatekeeper (GK2) or process owner actively sponsors the organizational level integration with an intention to institutionalize. Since institutionalization requires trading-off resources, and making social, political, and personal investments, the buy-in of the organizational level gatekeeper is critical. Successful project leaders acquired this level of support by giving visibility to their project and by facilitating the personal learning experience of the organizational level gatekeepers.

Figure 10: The Process of Frontline Leadership in Organizational Learning in iBPI



This organizational-level actor may or may not go through the entire learning cycle at the same time as the project team. However, over time organizational-level actors follow a similar individual learning path through the 4I processes (**Figure 10**). Their decision-making criteria is more complex since they are responsible for managing company resources as senior leaders. Their tests of validity and fit include these responsibilities. Gatekeepers must evaluate projects on their ability to help achieve strategic corporate targets and on the relevance of the insight or the solution to the entire organization. The decision to sponsor the institutionalization of a new insight is easier to make when group-level integration has proven stable and successful. When the solution is relevant to a large portion of the organization and aligned with corporate objectives, a frontline iBPI project is more likely to be institutionalized.

The individual learning of the gatekeeper includes attending (to the performance gaps or opportunities), intuiting and interpreting (insights about the relevance and fit of the frontline

project for institutionalization), and some level of testing and experimenting before a decision to allocate resources is made (case 2). The experimenting process might occur by proxy (case 1) with the stabilization of group learning. The confidence in the results will be strengthened further if additional groups also show positive stabilized learning and sustainable productive change, thereby confirming the functionality beyond the first group involved in the feed-forward loop.

Once the decision is made to institutionalize, the integration process begins between and within groups that will in turn decide how well the change works for them. Though employees may not challenge outright decisions made at the corporate level, forced institutionalization of a solution that the groups find objectionable may lead to limited compliance and avoidance (case 3). Ultimately, the procedures would remain in place, but over time behaviors would revert to the previous state and stabilization would fail to occur (case 4). This is significant because the feedback loop starts with the institutionalized knowledge, but that institutionalized knowledge may reside in the social structure and the practices of the groups and the individuals, which might differ from the documented knowledge.

V.II.ii.iii The role of the gatekeepers in connecting the levels of organizational learning. Stevens and Dimitriadis (2004) have pointed out that one of the limitations of the 4I model is that it seems to assume that individual and group learning will automatically evolve into organizational learning. They find that this assumption limits the applicability of the model. Lawrence et al. (2005) have addressed this gap by integrating power and politics in the 4I as the social energy that fuels the flow from one 4I process to the other. While we agree with the premise that organizations are political environments and therefore we must account for power,

frontline iBPI project leaders do not have the political or hierarchical power to coerce institutionalization and feedback.

Instead, we find that they must develop solutions that really address a need, can be readily applied, and become well accepted in order to sustain performance of a change. The validity of the solution in meeting the needs of a variety of stakeholders and its relevance to the group or the organization are necessary for institutionalization to succeed. Sponsorship by a gatekeeper (GK1) at the group level is critical to proceed through testing, experimenting, and group-level stabilization. It is therefore in the project leaders' best interest to include gatekeepers in the team learning and problem-solving process.

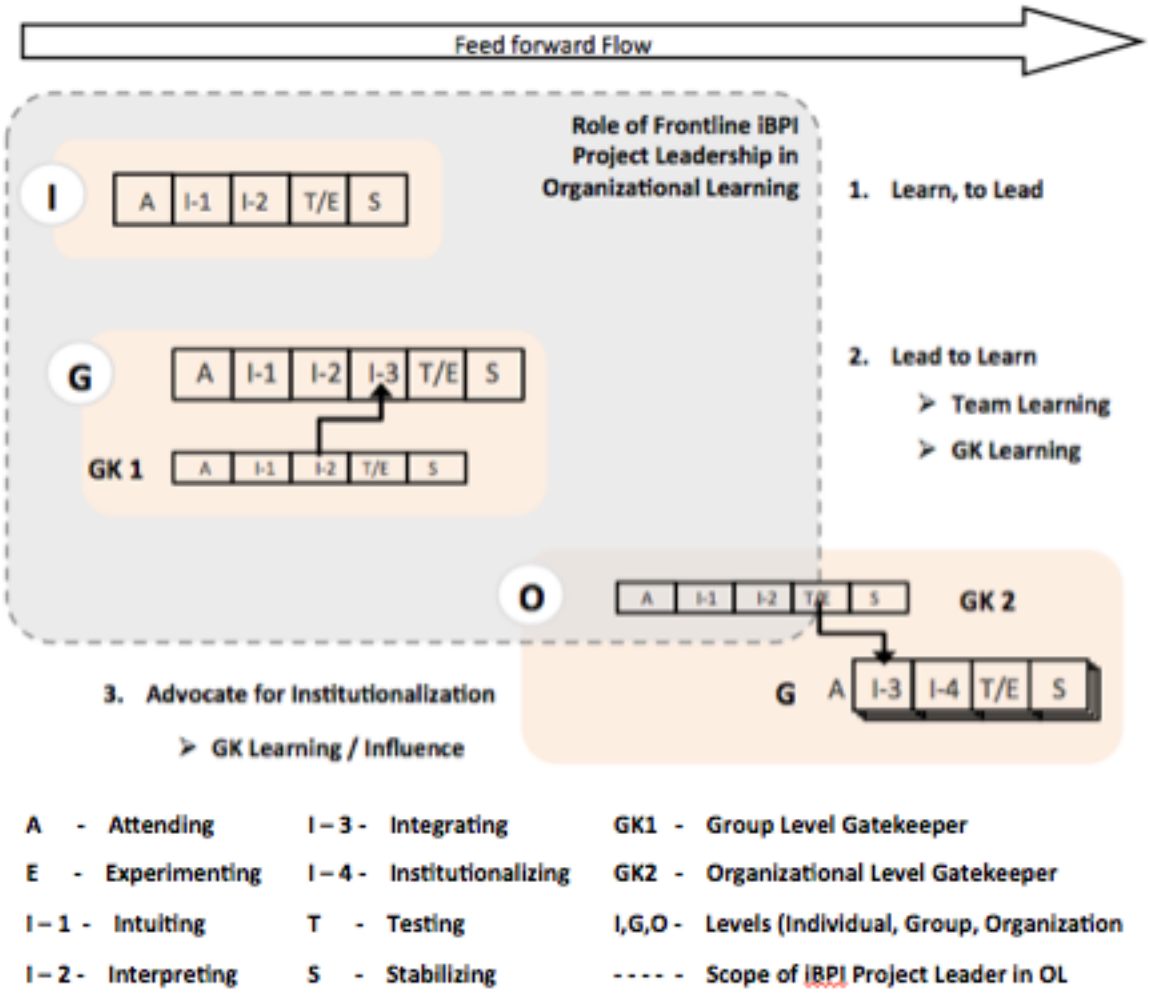
The shift to the organizational level will not even begin without the sponsorship of a gatekeeper (**Figure 10**, GK2) who must make a decision about allocating scarce resources and attention between new and existing ideas. Without senior sponsorship, the spread of the idea might be very limited and the organization loses an opportunity to capture important learning. The hierarchical distance between frontline leaders and organizational-level gatekeepers make this necessary connection more difficult. The project leader must find a way to bridge this gap (case 2) or enlist another advocate of the idea (case 1) to support and promote the visibility and suitability of the iBPI solution at the organizational level, where it must compete for resources with top-down mandates and initiatives. The individual learning process of the gatekeeper enables the move to the organizational level and the sustained, active, and visible sponsorship necessary to move through successful integration to stabilization of learning. Stabilization of learning occurs though the legitimization of the solution through testing and experimenting by groups within the organization (case 1). Their experience provides further evidence of success or

failure to the gatekeeper, who may continue or discontinue to sponsor utilization. If the sponsorship is maintained and utilization is high, the new learning becomes the default mode of operation (case 1).

V.II.ii.iv Leading with a learning orientation. The role of the frontline iBPI project leader is to deliver improved processes and productivity savings. As cases 1 and 2 demonstrate, the most effective way to produce these bottom-line results is by leading projects with a learning orientation. Rather than leading from certainty (case 4) and from knowing (case 3), successful project leaders led from pursuing their own learning while facilitating the learning processes of their teams. Further, by facilitating the development of knowledge within the levels of the organization and by facilitating the transition between the levels, frontline iBPI project leaders can develop solutions grounded in practice and deployed at the organizational level.

In our study, the context of Lean Six Sigma deployment and DMAIC methodology provided our Green Belt project leaders with the context to bridge the organizational gaps. Though all four project leaders followed the DMAIC methodology and earned certification as Green Belts, our cases show that the two project leaders who succeeded at organizational learning went far beyond the scope of work of a Green Belt project. They sustained advocacy and project leadership activities for over a year past the completion of their Green Belt certification requirements. In fact, they did not even pursue completion of the credentialing process until prompted and aided by the Black Belt in charge of certification.

Figure 11: Role of the Frontline iBPI Project Leader in Organizational Learning



Constructed from the combined experience of our Green Belts, our model of leadership for organizational learning (Figure 11) iBPI, shows the role of the project leader at each level of the 4I model. The larger perimeter shows the project leader's sphere of action. Concentrated on individual and group learning, the project leader's role includes, learning so they might lead, leading the learning processes of the team and the group level gatekeeper, and advocating for institutionalization. The latter occurs through the direct (case 2) or indirect (case 1) learning of

the organizational gatekeeper (GK2) who will also need evidence of success before committing organizational resources to the corresponding learning and unlearning processes. The actual process of institutionalization is outside the sphere of control of the iBPI project leader. But it can only be achieved through their own efforts to create a foundation of proven success, buy-in and relevance to the organizational level.

V.II.ii.v Learn, to lead. In the cases that led to organizational learning, project leaders went through their own discovery and learning process and they facilitated the learning processes of their teams, as well as the learning process of the gatekeepers or process owners who could approve and support the integrating process. Finally, they led with a clear vision and intention to have the solution institutionalized, going beyond their scope of work to obtain organizational sponsorship.

The project leaders' learning process became the context in which the leadership of the project unfolded. Project leaders attended to different stimuli and, as they learned, they brought their teams along. This exploration set the stage for leading the projects with a collaborative and inclusive learning orientation. In turn, the teams responded with more insights and more participation. Project leaders did not teach; they learned with their teams. Teams and project leaders adapted their roles to accommodate the emerging needs of the solution.

V.II.ii.vi Lead to learn. A key theoretical underpinning of the 4I model and our empirical results converge. Intuiting and interpreting are at the source of organizational learning. However, as we have demonstrated, the iBPI project methodology consists of progressive learning loops designed to elicit the emergence or insights and their development into testable hypotheses. We have also demonstrated that intuiting can happen at the individual or the group level. For a

project leader, completing a process improvement initiative means facilitating the learning process of the team over the course of the project.

Project leaders achieve group level learning by actively engaging in the learning process with their team and by proactively engaging the group level gatekeepers in the learning process. Creating and maintaining a learning environment is a key aspect of project leadership that anticipates several barriers to the deployment of solutions or to organizational learning. This co-creation of knowledge at the team level ensures a level of commitment and a level of ownership that pave the way for stabilizing knowledge and sustainable change. Inclusion of the group-level gatekeeper in the learning process paves the way for committed support through integration to stabilization.

The organizational-level gatekeeper controls the transition to the organizational level. However, the frontline iBPI project leader can help this gatekeeper attend to the potential benefits of duplicating the success of the group level throughout the organization. By facilitating the attending, intuiting, and interpreting processes, the project leader provides a context for sharing the results accomplished at the group level. This process allows the gatekeeper to experiment by proxy, prompting their testing of the solution against organizational alternatives.

Recognizing the trade-offs involved, the project leader can identify the insights or solutions that are relevant to the organization and position them in the context of larger organizational imperatives. This approach can increase the likelihood of institutionalization. Should the gatekeeper make the decision to proceed with institutionalization, the project leaders can also serve as an expert resource to group-level gatekeepers going through the integration process.

V.II.ii.vii Attend to learning, intend organizational learning. Only some insights or iBPI projects will be relevant for institutionalization at the organizational level. Beyond leading the project to completion and facilitating the learning processes of the team and the gatekeepers, the project leader also needs to attend to the potential applications of the insights that emerge from the project. Some insights may not be relevant for institutionalization, but as facilitators of the learning process, project leaders are close enough to identify and surface that potential.

V.III Summary

Frontline leaders of iBPI programs can contribute to organizational learning by developing solutions worth institutionalizing and by conducting projects with a learning orientation. The process of learning ensures better content outcomes and increases the likelihood of acceptance and utilization of the solution. More than learning how to learn, they learn how to lead group learning. In a circular fashion, the iBPI methodology guides the Green Belts through a process of learning, which positions them to lead while learning and in turn generates learners. Generating learners is an important outcome for any organization committed to continuous improvement and/or to organizational learning.

Though frontline project leaders do not have the power or authority to institutionalize learning at the organizational level, they can make a compelling case for their solution and provide evidence based on feed-forward group-level results. Further, iBPI project leaders can be instrumental in facilitating learning-oriented feedback loops based on knowledge that is already institutionalized. To lead either learning flow, Green Belts require the support of leaders with organizational authority, especially to bridge the gap between group and organizational level.

The result is a bottom-up solution developed by the team, vetted for the needs, preferences and specificities of practice and deployed with the power and leverage of top down formal authority.

CONCLUSION

Concluding this engaged scholarship research study, I briefly review the contributions to the theory and practice of organizational learning in iBPI. Next, I discuss the implications for the practice of iBPI. Finally, I review the limitations of this study and offer suggestions for future research.

Most of the articles on the 4I model focus on strategic leaders and how ideas originating from the top are cascaded down through the organization and institutionalized. This top-down view follows the hierarchical flow of formal authority and is very consistent with extensions of the model such as the one made by Lawrence et al. (2005), integrating power into the processes of the 4I model. This study examined the boundaries of the 4I model when applied to frontline leaders and the institutionalization of ideas they feed forward to the organization.

We find that the 4I model provided strong guidance in identifying cases to study. Indeed, they all appeared undifferentiated and equally successful at first glance, because of the incremental business process improvement measures of success. The 4I model helped us differentiate among the cases by zeroing in on relevant constructs and providing a multilevel model to get a 360^{o} view of the organizational learning process.

The nature of the projects on which the frontline leaders worked allowed me to collect a high level of granularity in the data and to leverage the Six Sigma program infrastructure to map the sub-processes of the project leadership process. Via field observation, interviews, and ongoing data collection, I tracked the project leadership process over time. This longitudinal data and process analysis revealed transient changes and sub-processes, which illustrated how some

iBPI project leaders facilitated organizational learning while others did not. These sub-processes extend our understanding of the 4I model when applied to the iBPI frontline leadership process.

My findings confirm the multilevel nature of the 4I model and the dynamic nature of the renewal in which learning occurs through the tension between feed forward and feedback. I propose to contribute to the literature on the 4I model by integrating the practice of evidence-based learning and iBPI programs into the 4I model. I extend the model to include the role and the process of leadership of organizational learning in iBPI for frontline employees.

The role of the frontline leader in iBPI is to facilitate the organizational learning processes leading to the development and the exploitation of knowledge. Understanding the process of leadership of iBPI projects clarifies the boundaries of the role. Organizational learning occurs through learning processes spanning three levels of the organization. These three levels are connected through the sponsorship of group-level and organizational-level gatekeepers. These gatekeepers have the formal authority to support or to stop the project and the flow of learning. The project leader manages the leadership process in the context of his own learning. This includes the learning of the team and the learning of the gatekeeper to ensure implementation and stabilization of knowledge through the group level.

VI.I Implications for Business Process Improvement Practitioners

The 4I model positions the feedback process as the process by which the organization exploits the insights that have been institutionalized. However, we found few instances of feedback beyond an occasional single loop, rigid replication of solutions. The current process bypasses the group-level integration process, where the group would have the opportunity to

adapt the insights to the specificities of their own practices. Instead, the project leader's interpretation is implemented with varied levels of success.

Practitioners managing a business process improvement program might consider the boundary conditions of the effectiveness of their programs. At a program level, if it is important to actively manage the balance of feed-forward and feedback projects. As we have demonstrated, both learning flows are much more effective when approached with a learning orientation facilitated by iBPI frontline project leaders. Since Frontline Green Belt project leaders typically work on projects only part-time and often have to negotiate time and resources to practice their Six Sigma skills, it is harder for them to get the ongoing support they need to focus on mastering the problem-solving skills they learn during training or to spend additional time interpreting or documenting learning. Acknowledging the contributions that frontline Green Belts can make to organizational learning and understanding the complexity of the process may prompt some adjustments, including the following five:

- implications for deployment model: institutionalize learning
- implications for deployment model: shift project resources to feedback
- implications for roles and responsibilities: align objectives with learning
- implications for project selection: begin feed forward with feedback in mind
- implication for metrics: measure (organizational) learning

VI.I.i Implications for deployment model: institutionalize learning. With these limitations in mind, in order to improve current practices, it might be necessary to institutionalize learning in the project leadership process. First, it is necessary to help Green Belts lead with a learning orientation. Making the ongoing learning process explicit and balancing the technical

focus with group learning and facilitation practice can jump-start the process of embedding learning into the practice of iBPI project leadership. Green Belt round tables and systematic after-project reviews will help Green Belts learn from both successes and failures. Training Black Belts and Master Black Belts as learning coaches as well as technical subject matter experts will support this shift from learning how to do, to learning how to learn.

VI.I.ii Implications for deployment model: shift project resources to feedback. With the ratio of project activities and resources dramatically biased toward exploration and not actively managed to encourage commensurate exploitation of the knowledge, there may be a significant opportunity cost. Projects led by frontline Green Belts have the typical abandonment rate of exploration projects (over 80%) (Bourg et al., 2008) and also typically have a lower savings target. This low project yield means that in order to deliver overall program target savings, successful exploration projects must deliver much higher bottom-line results to compensate for the high failure rate of remaining exploration projects. Shifting focus and resources primarily to institutionalization and feedback opportunities and secondarily to other exploitation opportunities would make the overall program more sustainable. Leading feedback loops with a learning orientation, iBPI project leaders would continue to develop learners but face fewer roadblocks in generating organizational-level visibility for their projects.

VI.I.iii Implications for roles and responsibilities: Align objectives with learning. To enable organizational learning from Green Belt projects, Black Belts, Master Black Belts, and project champions also need to attend to the knowledge gaps from which insights emerge and partner in the facilitation of the learning processes. Two specific areas of focus would be

identifying learning that should be institutionalized and helping to bridge the hierarchical gap to make the case with the organizational gatekeepers.

Black Belts and Master Black Belts can also facilitate the exploitation of knowledge by providing the social interaction necessary for project leader learning to occur while coaching with a learning orientation during the feedback loops. While documentation matters, program managers might consider ensuring that knowledge is coded or embedded in organizational routines or procedures in a way that facilitates exploitation by improving access and usability.

Finally, organizational learning occurs over time. The incentive to move quickly from one project to the next can jeopardize the integration or institutionalization of a solution. It is important to stay the course until stabilization occurs and to measure success accordingly.

VI.I.iv Implications for project selection: Begin feed forward with feedback in mind. The multilevel evolutionary selection process ensures that only insights or solutions from projects that have organizational-level relevance will be fed forward to institutionalization. Only opportunities for replication that promise financial and social payoffs will be worthwhile to the influencers who engineer integration and institutionalization. Perhaps relevance to multiple groups and ability to leverage feedback should be one of the primary selection criteria for frontline projects. Designing solutions around the opportunity to institutionalize would help provide bridge the gap between the group and organizational level by providing support for integrating and institutionalizing insights or solutions. This would facilitate a greater exploitation of organizational knowledge.

VI.I.v Implication for metrics: Measure (organizational) learning. The current measurement system—focused on speed of completion, savings from the group level project, and

certification—is painting a skewed picture of the true value added provided by iBPI project leaders. This measurement system might be a good candidate for organizational unlearning, to leave room for a measurement that recognizes the organizational learning dimension of success or the cumulative benefit of knowledge contributions.

VI.I.vi Conclusion: adjustments. In conclusion, iBPI programs have the potential to contribute significantly to organizational learning. In its current configuration, iBPI poses several barriers to frontline project leadership success. The imbalance caused by an overemphasis on feed forward and a limited feedback flow, make the program very inefficient. Further, the project scope includes the individual and group levels only, precluding institutionalization, save for some very enterprising and persistent project leaders. Finally, the productivity mandates behind program deployment demand results so quickly that they may jeopardize the learning process necessary for organizational learning. Part-time project leaders and their teams will be encouraged to "just do," which ultimately stops the continuous improvement loop. In failing to institutionalize a path to organizational learning, we might be institutionalizing a path to project failure. While the process develops learners, they may end up learning something unintended.

Fortunately, the theoretical lenses of the 4I model give us some insight into the role of the frontline leader in facilitating organizational learning in iBPI. This learning and influencing role at the organizational level sheds some light on the responsibility of the senior leaders in creating an iBPI project deployment structure that allows frontline leaders to lead for organizational learning.

VI.II Limitations

While we have identified the way the DMAIC methodology guides project teams and sponsors through an explicit and rational evolutionary selection process, we cannot ignore the realities of power and formal authority in organizations. This is the context within which projects take place. While we have integrated the impact of formal authority, even a rational allocation of resources and support and the decision-making processes of key actors are likely to be influenced by power and by elements extraneous to the project.

VI.II.i Integrating the role of emotions and motivation in organizational learning in iBPI. Our interviews and field observations reveal the project leadership process to be a very emotional process. Green Belts describe key events in colorful metaphors and express a wide range of emotions as they report out on their projects and as they reflect upon their learning. We bounded this study with the premises of the 4I model. However, the cognition-action loop that is the fourth premise of the 4I model does not capture this dimension of our data. A model of the process of leadership in organizational learning will continue to be incomplete so long as it fails to integrate emotions as one the key motors of learning, decision making, and behavioral change. Acknowledging the emotion-action-cognition loop and integrating its dynamic into the process would be a worthwhile extension of this work.

Finally, as learning develops over time, project leaders committed to organizational learning take on a larger scope of work over a longer period of time. Our empirical results show that the project leaders who choose to do the hard work of organizational learning follow a different process and have different motivations. Our empirical results show that they are more committed to their own vision of success and more motivated to continue until that vision is

fulfilled. Also that motivation does not match the rationale of self-interest. Indeed, these leaders may not get the credit for the additional work or the additional benefits from the project. Instead, they tend to be teased or ridiculed by their peers and looked upon with suspicion by their managers. Yet, they sustain project activities over the long run, long past the time when they might have been rewarded by the organization.

VI.II.ii Single-Person coding. Another limitation of this study is that the qualitative coding of the interview data was conducted by a single researcher. It is possible that multiple researchers would have coded the interviews differently. To minimize the potential single-person coding bias, a key informant assisting in the research coded a pilot interview. The same key informant participated in the subsequent analysis of the research findings.

VI.III Future Research

Case 1 and 2 project leaders are examples of project leaders who have defined their own roles, their own scope of work, and their own images of success and who seem motivated by something beyond their own self-interest. Both project leaders understood, recognized, and leveraged the power and organizational politics of formal leaders to facilitate organizational learning. Yet, especially in case 1, the behavior of the project leader behavior is inconsistent with power and politics. These findings supplement further the need to extend our understanding of leadership for organizational learning beyond the rational model, to explain the role of emotion and motivation in organizational learning in incremental business process improvement.

This study yielded actionable knowledge about the practice of iBPI project leadership, which is of immediate strategic relevance to consultants, senior leaders, and iBPI project leaders. Using an embedded case study allowed me to keep the corporate environment constant across

cases and focus on the impact of project-level dynamics. A follow-up research study comparing several organizations would contribute to our understanding of the role of values-based leadership and corporate ethics in organizational learning in iBPI.

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