A DEVELOPMENTAL WORK RESEARCH (DWR) STUDY OF TEAM AND ORGANISATIONAL LEARNING AT DHL WORLDWIDE EXPRESS

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Abstract

The environment in which New Zealand businesses and public agencies operate is volatile, complex and uncertain. Organisations face a wide and competing range of demands. Managers and employees need to collaborate across functions, business units and teams. Practical research approaches are needed to help support them.

This paper illustrates how a developmental work research (DWR) approach can support business process improvements and organisational learning in continuously-changing, complex environments. We present findings from a PGSF study of cross-functional team problem-solving and learning at DHL Worldwide Express in Christchurch between April 1997 and June 1998. The study used DWR methods, including analysis of video-taped meetings, developed at the University of Helsinki and the University of California San Diego by Engestrom and his colleagues (1996b).

We describe how DWR was used to: analyse a process improvement initiative, or 'problem-trajectory', and how disturbances and tensions within this work activity reveal the underlying contradictions in DHL's operational and training systems; and identify opportunities for comprehensive system innovations that have a marked impact on productivity, efficiency and customer service.

Keywords: *developmental work research; organisational learning; business process improvements; management rapid change; team problem solving.*

The study of team learning at DHL was part of a wider programme of research on 'Learning and Expertise in Teams and Networks' (LETN), which was funded by the Public Good Science Fund between 1996-1998. The research sought to understand how cross-functional work teams and networks learn, gain expertise, innovate and solve problems in environments of rapid change and uncertainty. A parallel study of team learning was carried out at the Wellington-based company, Formway Furniture, where we studied problem-trajectories of both a product development team and operational team.

At DHL's Christchurch station we analysed the problem-trajectory associated with the process of restructuring four suburban courier routes as annual turnover increased by 20 per cent. In the first phase of this business improvement initiative, DHL established a Route Restructuring Project and a cross-functional team comprising the services manager, imports supervisor, despatcher and four courier drivers. The team met seven times between August and October 1997.

In the second phase, a smaller management and supervisory team (services manager, imports supervisor and a new despatcher) met frequently and informally between January and March 1998 to implement an additional fifth route and appoint a fifth full-time courier. We refer to this as the Fifth Route Project.

The route restructuring occurred during a period of continuous change and complexity, marked not only by a rapid increase in turnover, but also by:

- the introduction of a new automated despatch system (AUD) in August
- the Asian financial crisis in the latter part of 1997 and early 1998, and
- the departure in December of the experienced despatcher

Our research approach drew on developmental work research and Activity Theory using the methods of Engestrom and his colleagues (eg. see Engestrom 1996b; 1987), which

we describe in a later section of the paper. We also drew on our previous case studies of the management of technological change, workplace reform, total quality management and business process reengineering (Hill and Gidlow, 1988; Perry et al, 1995), and on our recent work on skill formation and the learning organisation (Capper et al, 1995; and Hill et al, 1998).

Our study at DHL focused on the two phases of route restructuring, and drew on data from work-team meetings of couriers and customer service agents respectively, which began during the second phase. Our research team of three carried out the 'trajectory analysis' based on the following broad range of data:

- semi-structured interviews at both corporate (Auckland) and work-site (Christchurch) levels covering corporate human resource personnel, management and supervisory staff, the despatcher, couriers and customer service agents

- observations of key aspects of work activity (eg. members of the research team observed the loading and unloading of shipments in the warehouse, accompanied couriers on several runs delivering and picking up shipments, and flew from Wellington to Christchurch on chartered aircraft carrying DHL freight)

- a sequence of seven video-taped meetings of the Route Restructuring Team and five work-team meetings (two of which were also video-taped) using an adaptation of Engestrom's method

- analysis of minutes and other 'tools' that were used in the team meetings (e.g. a map of Christchurch with detailed information on the four routes, statistical data), daily and weekly operational reports, email memos

- follow-up interviews with members of the teams

- analysis of DHL corporate material

- analysis of the responses to oral and video-taped feedback sessions with the project teams. These were also video-taped.

The body of the paper is in six sections. The first provides background on the central tensions facing organisations that seek to compete in complex environments of uncertainty. The second provides an introduction to Activity Theory and DWR and explains why they are powerful tools for workplace learning. In the third section of the paper we summarise the objectives and outcome of the 'Route Restructuring Project'.

In the fourth section we describe a number of 'disturbances' that occurred in the latter part of 1997, particularly the introduction of the automated despatch system in August 1997; and in sections five and six we illustrate how these disturbances revealed contradictions in DHL's operating and training systems that only became apparent as the fifth route was introduced between January and March 1998. In the concluding section of the paper we highlight the study's

implications for managers, supervisors and researchers, as well as for future research directions.

Learning in complex environments of uncertainty

Our previous New Zealand case studies support the findings of a recent Innovation Research Programme in the United Kingdom that show that organisations are being stretched to the limits in their ability "to integrate, synthesise, rethink, reframe, adapt and learn"[1]. Managers and teams are being expected to achieve previously incompatible objectives such as low costs, high quality products, fast delivery and continual innovation (Blackler et al, 1997).

As Blackler et al (1997) conclude, a successful enterprise in the late 1990's is one that has the capacity to learn and quickly apply new knowledge. This type of enterprise successfully manages the central tensions that are involved in operating in a fast-moving and complex environment (see Table 1).

Finnish and British experience with a developmental work research approach shows that DWR can assist organisations to learn and quickly apply new knowledge. Our PGSF project was designed to trial and further develop Activity Theory and DWR in a New Zealand context, building on our case study experience of technological change, workplace reform, skill formation as well as organisational learning.

Activity theory and DWR: tools for workplace learning

Our earlier New Zealand case studies had shown that, in their attempts to promote continuous improvement and organisational learning, managers and researchers typically focus on the actions of individuals, and on the concept of the individual mind (Capper *et al*, 1995; Hill *et al*, 1998). They assume a traditional model of skill in which the unit of analysis is taken to be the individual, as if expertise "resides under the individual's skin" in the form of explicit or tacit knowledge, skills and cognitive properties (Engestrom, 1992). In marked contrast, Activity Theory views activity "not as a simple individual action but as being culturally and historically located" (Hasan, *et al*, 1998:2). The unit of analysis is the *work activity itself*. Engestrom, who first applied the theory to workplace learning, shows that the work activity system is comprised of the following components:

- individual workers, their colleagues and co-workers

- the conceptual models, tools and equipment they use in their work

- the rules that govern how they work, and

- the purpose to which members of the workplace community direct their activity.

In Activity Theory and DWR, all of these elements are analysed together *as a unified and dynamic whole*[2].

Table 1. Central tensions in fast-moving environments.

Short-term needs for survival	Long-term needs for development.
Established strengths of the business new technologies	New customer demands, new possibilities,
Advanced planning	Continuous constructive improvisation as the business environment changes
Need for rules and procedures	Need for dialogue, reflection and organisational learning

Source: Blackler et al, 1997

A key feature of the DWR approach is that work activity is mediated both by tools from the particular workplace culture and setting (e.g. language, gantt charts, whiteboards, computer systems) and by the less visible *social* mediators of work activity. These social mediators can be grouped into three areas:

- the formal and informal rules (e.g. corporate policy, quality standards, human resource procedures, how to behave towards the CEO and who can use the company car park)

- the work community (e.g. different business units, customers, suppliers), and

- the division of knowledge and occupations (e.g. accountancy, engineering, marketing; process operator, supervisor).

A model of the work activity system is shown in Figure 1 with illustrations from the DHL case study that we describe in later sections of the paper.

We used the DWR approach to understand the technical, social, cultural and cognitive factors involved in collaborative learning in New Zealand work settings that are grappling with the tensions described in the previous section (see Table 1). We wanted to apply, test and further develop the DWR techniques and theory because we saw that they provided practical ways to design "interlocking technical and social structures" that would support the learning that is needed 'for adapting to rapid and unexpected demands from the environment' (Engestrom and Engestrom, 1986:3).

The Route Restructuring Project

The Route Restructuring Project was designed to restructure the existing four courier routes, and it had four main objectives:

1. to optimise customer service, including achieving a 100 per cent delivery target by 10.00am for overnight Australian shipments

2. to achieve operational and cost-efficiencies

3. to even-out courier work-loads

4. to cope with the rapid and significant growth in shipments

In order to achieve these objectives, the project team used a problem-solving process that can be understood as a sequence of actions in an 'expansive learning cycle'. The cycle was developed by Engestrom (1987) and is a core concept of DWR (see Figure 2).

The team began the learning cycle by questioning the efficiency and effectiveness of the existing routes. They used two main types of tools:

1. a large road map of the Christchurch metropolitan area pinned up in the meeting room, and coloured pins showing the areas where business and residential customers were located

2. spreadsheet analysis of data relating to the average number of 'moves' made by a courier over a given route

The team carried out their data analysis in two ways: they analysed historical aggregate data that had been gathered over the previous six months (see sequence 2a, Fig. 2); and the imports supervisor designed a tool to enable the couriers to gather detailed data on the geographic location of the pickups and deliveries over a two-week period. The data were analysed, and the results reviewed at a subsequent meeting (see 2b, Fig. 2).

The team then modelled a new solution (see 3, Fig. 2) by restructuring the routes on two occasions. Each time they carried out a week-long trial with the new model and examined the results (see 4, Fig. 2). The second model was subsequently implemented (see 5, Fig. 2).

Problems with the auto despatch system

However, one factor that appeared to have been of crucial significance for the effectiveness and efficiency of DHL's pick-up and delivery system was the operation of the new 'auto despatch system' and its interface with the computer-based customer services module (CSM).

Auto despatch, as the name implies, is a computer-based system designed to automate key elements of the despatcher's function. A simplified example helps to explain how the system was designed to work. When a local customer phones DHL with a request for a shipment to be picked up, the customer service agent enters the information into the

CSM. This information is automatically sent to the AUD, which transmits the pick-up details to the pager of the courier who is covering the appropriate route. Jobs which fall outside a pre-determined set of criteria are 'designed to fail' so that they can be manually handled by the despatcher. For example, if the shipment exceeds a certain weight, the despatcher could use his judgement and manually allocate the pick-up to the courier who was driving the largest van that day.

The new auto despatch system was implemented between July and August, 1997. During that time the despatcher travelled to DHL's Auckland station for training. This was followed by a two-day training session for the Christchurch-based couriers, focused predominantly on the use of their new pagers.

A typical example of the ongoing problems that were occurring with the auto despatch system in the latter part of 1997 was given by the imports supervisor in a follow-up interview in May 1998. The supervisor, who was a member of both project teams, and a former courier driver and despatcher, explained that after the implementation of the new system,

"The auto despatch often directed the pick-up to the wrong courier. He then had to use the RT [radio telephone] to tell the despatcher, who then cancelled it off
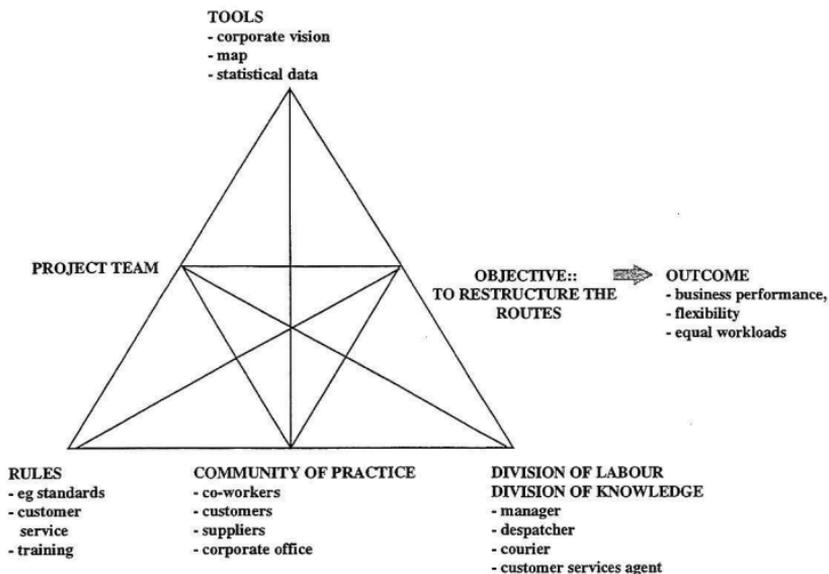
his pager and redirected it to the correct courier. Initially [in the latter part of 1997] about 40 per cent of the jobs were failing."

However, the despatcher developed a comprehensive, although largely tacit, understanding of the auto despatch system. He compensated for the problems by regular phone and e-mail contact with the DHL's IT specialist in Auckland and by manually manipulating nine different tables that set the criteria for determining how the pick-ups were allocated.

At the end of December 1998, the experienced despatcher left New Zealand to seek work in DHL's UK operation. With the intervention of the Christmas holidays and the time-lag before the new despatcher was available to commence work, the hand-over period was reduced to two days.
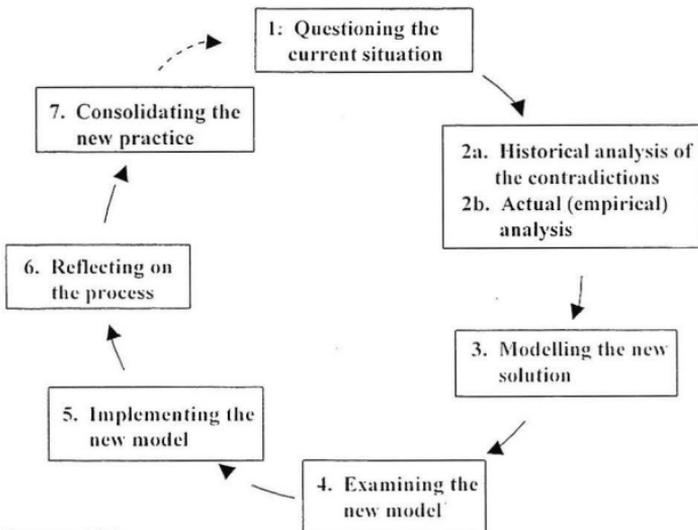
In January 1998, DHL Christchurch gained approval to introduce a fifth route and to appoint a fifth courier driver. Faced with a situation where much of the knowledge of the AUD had remained tacit, the new despatcher and the imports supervisor began an intensive phase of experimentation and learning in consultation with the Christchurch services manager and the DHL's IT specialist in Auckland. The Fifth Route Project team began to meet informally. Together they uncovered a complex set of problems with the design and implementation of the AUD and its interface with other

Figure 1. Example of Work Activity System at DHL

TOOLS
- corporate vision
- map
- statistical data

PROJECT TEAM

OBJECTIVE:: ➡ OUTCOME
TO RESTRUCTURE THE
ROUTES
- business performance,
- flexibility
- equal workloads

RULES
- eg standards
- customer
  service
- training

COMMUNITY OF PRACTICE
- co-workers
- customers
- suppliers
- corporate office

DIVISION OF LABOUR
DIVISION OF KNOWLEDGE
- manager
- despatcher
- courier
- customer services agent

Source: Adapted from Engestrom, 1997 and Blackler et al, 1997

Figure 2. Sequences in an Expansive Learning Cycle

1: Questioning the current situation

7. Consolidating the new practice

2a. Historical analysis of the contradictions
2b. Actual (empirical) analysis

6. Reflecting on the process

3. Modelling the new solution

5. Implementing the new model

4. Examining the new model

Source: Engestrom, 1996

operational and training systems. Continuing experimentation and reflection led them to make comprehensive systems innovations - in the context of a continuing and uncertain business environment exacerbated by the Asian financial crisis.

In summary, our analysis suggests that the earlier Route Restructuring Project led to a situational 'solution innovation' rather than the comprehensive 'systems innovations'[3] which occurred after the Fifth Route Project team commenced their work. Our argument is based on triangulating all sources of data with an analysis of times in the Route Restructuring Project meetings when opportunities for team learning and wider systems innovations were blocked. We used the 'modes of disturbance management' as an analytical tool to analyse the video data, following the method of Engestrom and Mazzocco (undated), and we discuss this in a later section of the paper.

Why these problems were not explored by the project team

Notwithstanding the importance of auto despatch, throughout the course of the Route Restructuring Project meetings between August and October, the AUD was explicitly discussed on only a handful of occasions. At no time did this appear to lead to detailed exploration among the project team of the problems and contradictions that began to be uncovered by the Fifth Route Project team between January and March, 1998.

Analysis of transcripts of the project meetings, interviews and observations suggest that the failure to explore the problems and contradictions relating to the AUD occurred for five main reasons:

1. The Route Restructuring Project team restricted their critical questioning to the elements of the work activity system that related - in Activity Theory terms - to the tools that they used to plot and monitor the changing patterns of customer activity (see Figure 1).

2. Moreover, the project team relied primarily on only two sets of tools - the road map and the quantitative analysis of courier pick-ups and deliveries over a two-week period. Although the new auto despatch system had been recently implemented, the team did not use the opportunity of the project meetings to expose the system itself to ongoing experimentation through wider critical questioning.

3. Although the cross-functional team included the services manager, imports supervisor, and a majority of the courier drivers, it did not include the customer services agents who were also a key part of the work activity system. In Activity Theory terms, the team did not include all members of the 'community of practice' (see Figure 1).

4. The despatcher used manual methods to overcome the design deficiencies in the AUD, relying on his tacit knowledge, the information that he gained in his initial

training, and the phone and e-mail conversations with the Auckland IT specialist.

5. A further significant factor was that, in its meetings, the team used ways of managing disturbances that avoided open conflict and, hence, opportunities for innovation. We discuss this fifth reason more fully in the next section.

It is crucial to note that our earlier New Zealand case studies, in previous research programmes, show that DHL's experience was typical of other similar leading companies which operate in environments of rapid change and uncertainty.

Disturbances and contradictions

In Activity Theory, the process of expansive learning should be understood as construction and resolution of successively evolving tensions, disturbances or contradictions in a complex system of work which includes:

* the object(s) of the activity

* the mediating artefacts or tools

* the perspectives of participants (Engestrom, 1992)

Engestrom and Mazzocco (Ibid:2) define disturbances as:

"deviations from the normal scripted course of events in the work process, normal being defined by plans, explicit rules, or tacitly assumed traditions. A disturbance may occur between people and their [tools or] *instruments, or between two or more people. They appear in the form of an obstacle, difficulty, failure, disagreement, or conflict."*

As Engestrom and Mazzocco explain, within Activity Theory, 'disturbances are interpreted as symptoms or manifestations of historically evolving *inner contradictions* in the given activity system'. At the core of the theory is the idea that these contradictions are a key to "understand the sources of trouble as well as the innovative and developmental potentials of the activity". (Ibid)

These researchers, together with other writers working in the DWR tradition, have identified seven modes that teams use to manage disturbances (Ibid:13):

1. negotiating (one or more team members make adjustments or concessions, or agree to take joint action to solve a problem)

2. accepting responsibility (accepting personal responsibility for a problem)

3. using authority (invoking superior rank)

4. complaining (expressing discontent, and the complaint goes unanswered)

5. avoiding confrontation (a challenge is met with damping down or changing the subject eg. by joking)

6. engaging in open conflict (a complaint leads to disagreement and open argumentation between conflicting viewpoints)

7. attempting or completing an innovation (eg. one or more team members suggests changes, improvements, or novel procedures and tools, as a response to a problem)

Engestrom and Mazzocco (Ibid:2) explain that the first five modes are:

"manifestations of containment, without intervention in the given norms of the work practice. Open conflict and innovation indicate that there is at least a possibility of questioning and perhaps changing or improving the practice - which represent characteristics of double-loop or innovative organisational learning."

Opportunity lost for comprehensive systems innovation

As a result of the five factors outlined above, an opportunity was lost to identify the tensions and incoherencies that were occurring within and between the different occupational groups. Our analysis of data from the two sets of work-team meetings of the customer services agents and couriers respectively, suggests that during the latter part of 1997 these operational breakdowns were typically experienced as conflicts among these different groups. In other words, one group (whether customer services agents or couriers) was often seen by the other as being the cause of the operational breakdown. This explanation masked the breakdowns that were, more typically, caused by *systems problems* that resulted from the combination of these three main factors:

1. Problems in the socio-technical design of the CSM and/or AUD systems. The DHL study underlined findings from our previous research that show that organisations often design and implement new computer-based information systems by drawing on a limited range of specialist, 'technical' knowledge as if these new work systems were purely technical - rather than *both* socio-cultural *and* technical in nature (Badham, 1992).

2. Insufficient familiarity and understanding by one occupational group of the others' roles and functions. This led to breakdowns in the information flow from the customer, to the customer services agent (who entered the information into the CSM), to the courier driver's pager, allowing the courier to process and act on the information out on the road.

3. Different members of staff were unable to absorb and process substantial amounts of new, and constantly changing, information on an ongoing basis because the pressure of day-to-day operations did not allow room for reflection and shared learning.

Our analysis shows that, in information-intensive environments of constant change and uncertainty, jobs need to be designed not only to meet operational requirements, but to build in ongoing opportunities for reflection and creation of expansive learning cycles. This is particularly the case

when new technologies and information systems are being introduced. However, pressure 'on the bottom line' often means that there is an inadequate number of staff to allow time for this built-in reflection. Moreover, 'front-end' and 'one-off' training is usually given when new computer systems are implemented, without systematic and ongoing experimentation, feedback and learning in cross-functional team settings - creating opportunities for what Blackler et al (1997) describe as "boundary innovations".

When the Fifth Route project team was set up to implement the fifth route, the services manager, the imports supervisor and the new despatcher began a process of critical questioning and experimentation with the system that led to a number of system innovations. For example, the couriers, the CSA's, despatcher, supervisor and manager began to share information and experiences systematically in their new fortnightly meetings. This led to joint construction of new solutions or innovations, active experimentation and reflection.

Conclusion

Our research at DHL shows that a critical task for successful problem-solving and innovation is for teams to develop a shared, and dynamic understanding of: 1) the purpose of the work activity; 2) the conceptual models, tools and equipment that are used in carrying out the work; and 3) the different elements, or mediators, of the work activity system. Continuing analysis and reflection on the tensions and contradictions among these elements provide opportunities for innovation and problem-solving. A key challenge for managers, team leaders, human resource personnel and educationists is to *embed this shared process of collaborative learning in ongoing work activity.*

Future research

Future research needs to be directed towards developing practical applications of the DWR approach in New Zealand workplaces in both public and private sector organisations. The DHL study, and our previous research, point to opportunities to apply the approach to:

1. address the limitations of current approaches to strategy development (Hamel, 1998)

2. overcome the reported failures with continuous process improvement initiatives such as total quality management (eg see Frei et al, 1993)

3. the management of technological change (eg. see Addison, 1998)

4. integrate technical, social and cognitive factors for more effective knowledge creation, management and diffusion

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