

***LEARNING FROM PROJECTS: THE INTERPLAY OF
ABSORPTIVE AND REFLECTIVE CAPACITY.***

Theme: The Social Processes of OL and KM

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Abstract

Project-based forms of organising are increasingly adopted across a range of industry sectors in response to environmental uncertainty and needs for innovation (Drucker 1998). This increasing reliance on projects creates new challenges for management, however. On the one hand, such projects represent an important, perhaps the most important (Ayas and Zeniuk 2001), source of knowledge generation within the organization. This makes the prospect of capturing the learning from project-based work and making it available to other projects and the wider organisation a particularly attractive one, offering significant potential benefits of more resource-effective and flexible responses to new tasks and problems. On the other hand, a key problem in relation to project-based work is the transfer of learning from one project to another, whereby each newly formed project starts anew rather than learning from what has been done previously (Prusak 1997). This 'internal stickiness' (Szulanski 1996) of knowledge can be seen as reflecting the 'absorptive capacity' of the organization (Cohen and Levinthal 1990).

Some commentators respond to this challenge to existing management practices by stressing the potential value of projects as a source of learning for organizations. They argue that 'project-based organizations offer an excellent opportunity to engage in learning and to acquire reflective habits that transcend the boundaries of projects....' (Ayas and Zeniuk 2001). In this perspective, the development of 'reflective practices' (Raelin 2001) on the part of those involved plays a key part in enabling firms to capture learning benefits from projects. As DeFillippi puts it: 'projects may prove immensely beneficial to the long-term success of companies when these companies systematically incorporate reflective practices into their project management processes.' (DeFillippi 2001).

This review of the existing literature thus suggests two different theoretical perspectives on the ability of organizations to exploit the learning generated by projects; one which emphasizes the structural embeddedness of knowledge in terms of the firm's absorptive capacity; and another which highlights the processual nature of learning and which places greater stress on the firm's reflective capacity.

This paper seeks to evaluate the relative usefulness of these alternative accounts through an analysis of the findings from a qualitative study of cross-project learning. The aim of this study was to identify the principal constraints on the transfer of learning between projects, and the means by which organizations overcome those constraints.

Our findings are grounded in a qualitative study of two collaborative projects in the same organizational setting. The findings from our case-study highlight the interplay between absorptive capacity and development of reflective practices in determining the capture and transfer of project-based learning.

Introduction

Project-based forms of organising are increasingly adopted across a range of industry sectors in response to environmental uncertainty and needs for innovation (Drucker 1998). Projects thus represent important loci of learning within the organization (Ayas and Zeniuk 2001). The need to manage new uncertainties within a tightly defined time and resource framework is seen as highly conducive to learning (Hartmann et al. 1998) .

As project-based forms of organizing become more widespread the importance of these loci of learning increases in like measure. In addition, the recent period has seen the development of more reflexive approaches to knowledge and learning exemplified by the discourse and practices of the ‘learning organization’ and ‘knowledge management’. Taken together, these trends have highlighted the potential benefits of the learning generated through projects for the organization as a whole. This performative orientation towards learning emphasizes the opportunities to reduce costs and increase flexibility by capturing the learning generated in project work and transferring it to other sites.

Growing recognition of this learning potential of projects has been tempered, however, by an awareness of the particular difficulties which beset attempts to mobilize project-based learning in this way. Projects typically lack the formal structures and incentives which would enable learning to be institutionalized (Ekstedt et al., 1999). Project-based organizing is seen as being subject to the risk of ‘learning closure’ (Hobday 2000: 885). As a result, each newly formed project starts anew rather than learning from what has been done previously (Prusak 1997).

This paper will explore this tension between the perceived potential and the actual realization of project-based learning through a case-study encompassing two linked projects. The aim of the paper is develop our understanding of project-based learning by applying different analytical perspectives to our case material. The analysis of our empirical study from these different perspectives will explore their relative usefulness for understanding the dynamic and highly contextualized nature of project-based learning.

In developing this account, the paper will begin with a review of the existing literature in the field. Based on this, two contrasting perspectives on project-based learning are identified; the absorptive capacity perspective and the reflective capacity perspective. Both of these perspectives provide ways of analysing learning by organizations, but they represent divergent views of knowledge and learning and the means by which these are applied to practice. Subsequently, the case materials are presented and then reviewed through the application of these perspectives. This allows us in our final section to derive some preliminary conclusions as to the relative usefulness of different perspectives for the analysis of project-based learning.

Perspectives on project-based learning

Views of the prospects for project-based learning in the existing literature encompass a range of epistemological and ontological positions. In particular, existing studies provide a diverse

range of views on the nature of knowledge and learning, with corresponding implications for their prognoses on the opportunities and barriers applying to project-based learning.

For the purposes of this paper, we are focussing on two perspectives which, while only strands within a wider literature, do offer usefully contrasting views on these issues. Firstly, drawing on one important strand which is widely represented in the strategic management literature, we identify the absorptive capacity perspective on project-based learning. Secondly, and characterising a number of studies within the organizational learning field, we identify what we will term the 'reflective capacity' perspective.

The first of these perspectives has its origins in a paper by Cohen and Levinthal. This draws attention to the importance of prior related knowledge in the firm's ability to absorb new knowledge. This 'absorptive capacity' is defined as; 'an ability to recognise the value of new information, assimilate it and then apply it to commercial ends.' (Cohen and Levinthal, 1990: 128). Importantly, 'absorptive capacity refers not only to the acquisition or assimilation of information by an organization but also to the organization's ability to exploit it.' (Cohen and Levinthal, 1990: 131). Although the original concept referred to the organization's ability to absorb externally-sourced knowledge and information, more recent developments have suggested that it can also be applied to the intra-organizational absorption of knowledge (Szulanski 1996).

Cohen and Levinthal identify a number of features which influenced firms' absorptive capacity. These include; 'the level of prior related knowledge' (p. 128); 'the sharing of a common stock of knowledge, both technical and organizational, that facilitates the transfer of knowledge within groups...(p.133); and the relationships between departments within the organization.

Szulanski's work further develops this perspective in his account of the transfer of knowledge between settings. He argues that what he terms the 'stickiness' of knowledge can be analysed in terms of the characteristics of the source, the recipient, the knowledge itself, and the context in which transfer takes place. His study found that the three most important barriers to knowledge transfer were the 'lack of absorptive capacity of the recipient (i.e. the level of prior knowledge), causal ambiguity and an arduous relationship between the source and the recipient' (Szulanski 1996): 36).

These studies collectively provide us with a particular perspective on project-based learning. In this perspective, the difficulties of capturing such learning and making it available to the rest of the organization are defined in terms of the barriers to knowledge transfer. Ontologically speaking, knowledge is defined in terms of the specification of cause-effect relationships. It is viewed as the product of learning-by-doing processes and is seen as a moveable entity with its mobilization being influenced by organizational and individual features that facilitate transmission and reception between individuals. This view highlights the importance of, firstly, the organization structure - functional organizational forms being seen, for instance, as rather inflexible in absorbing knowledge compared to divisional forms (Van den Bosch 1999). Secondly, it emphasizes the importance of inter-unit relationships and informal networks as the means of knowledge transmission (Hansen 1999) Third, it highlights the fit between the characteristics of the knowledge being transferred and the prior knowledge of the recipient. Fourth, it focusses on the existence of common knowledge shared by different groups as enabling the transmission of knowledge. For example, Hoopes and

Postrel (1999) found that a lack of related knowledge common to the parties involved in the project was the major problem in knowledge transfer during product development. Overall then, the absorptive capacity perspective highlights the structural distribution of pre-existing knowledge, particularly the depth and degree of specialization and the links between different sub-units, as a crucial determinant on the transfer of project-based learning from its original locus to other settings. It suggests that project-based learning can be analysed in terms of the fit between the nature of the learning generated and features of the organizational context, including levels of prior knowledge and common knowledge, the role of formal structures, and the structural features of networks.

In contrast to this view, our second perspective shifts the focus from the structures and systems of the organization to the development of reflective practices by groups and individuals. In what we will term the ‘reflective capacity’ perspective, the mobilization of project-based learning is related to the development and extent of ‘reflective habits that transcend the boundaries of projects...’ (Ayas and Zeniuk 2001). In this perspective, such ‘reflective practices’ (Raelin 2001) play a key part in enabling firms to capture learning benefits from projects. As DeFillippi puts it: ‘projects may prove immensely beneficial to the long-term success of companies when these companies systematically incorporate reflective practices into their project management processes.’ (DeFillippi 2001).

The absorptive capacity perspective, as we have seen, highlights the structural conditions which enable or constrain the spread of project-based learning as a form of knowledge transfer. The reflective capacity perspective, however, can be defined as being concerned with the psychological and cultural conditions under which reflective practices and hence learning takes place. The emphasis is on learning-by-reflection rather than learning-by-doing, and the generalization of project-based learning is seen not as a question of knowledge transfer but as the development of what Ayas and Zeniuk (Ayas and Zeniuk 2001) term ‘systemic and collective reflection’ or Raelin terms ‘public reflection’ (Raelin 2001).

The contrast between these two perspectives – which as broad characterisations inevitably lack attention to important nuances of particular studies – is summarised in Table 1.

Table 1: Different perspectives on project-based learning

Absorptive capacity perspective	Reflective capacity perspective
<i>Learning-by-doing</i>	<i>Learning-by-reflection</i>
<i>Knowledge transfer</i>	<i>Systemic and collective reflection</i>
<i>Structural conditions</i>	<i>Cultural and psychological conditions</i>

The reflective capacity perspective is particularly relevant to project-based learning precisely because reflection is such a problematic activity in project settings. Existing studies highlight a number of factors which have been seen as both conducive and detrimental to the development of reflective capacity in organizations. First, tensions between cultures or worldviews in project work are seen by some writers as a stimulus to learning by dint of their

promotion of reflective practices. Such tensions are said to ‘ignite processes of deeper mutual (self) understanding and reflection.’ (Grabher 2002), even though as Gherardi and Nicolini (2002) put it ‘comparing among perspectives means both comprehending and not comprehending, accepting diversity as well as rejecting it’ (Gherardi and Nicolini 2002): 433). Second, the time-bounded characteristics of project work can equally be seen as helping to promote and constrain reflection. In one view, the chronic time pressures of project work squeeze out time for reflection and neutralize the use of formal mechanisms of learning capture (Keegan and Turner 2001) . In another study, however, project deadlines are seen as creating a ‘rationalistic break’ which encourages reflection before action (Lindkvist, Soderlund et al. 1998). The time boundaries of the project may also be important in preserving a plurality of cultures and world-views amongst different groups. As Grabher puts it; ‘Project schedules preserve the diversity of, and tensions between, professional and organizational cultures from turning into collaborative paralysis’ (Grabher 2002): 208). In this sense, deadlines not only help to secure the autonomy of the project from other activities but also maintain cognitive diversity; ‘temporary limitation prevents any single perspective from becoming corrupted by a hegemonic view...deadlines provide antidotes against lock-ins into particular cognitive or aesthetic patterns.’ (Grabher 2002: 249).

The comparison between these broad perspectives suggests two very different prognoses for conditions favourable to the development and generalization of project-based learning. On the one hand, the absorptive capacity view seems to suggest that the most favourable conditions for knowledge transfer involve similarity between new knowledge and prior knowledge, a high level of common knowledge and low levels of functional differentiation. Conversely, the reflective capacity perspective suggests that such differentiation can operate in a positive way. The diversity of worldviews developed by different communities is seen as an important factor in stimulating learning within projects by encouraging reflection on new meanings.

In order to explore these perspectives further, the next section of the paper will present a case-study of two linked projects in the water industry. This case-study is part of a larger study of project-based learning, The unit of analysis was the project. What the case study gives us that other research designs cannot is an intensive and longitudinal investigation of processes and contexts. The limits of qualitative research involving single cases are well documented (Yin 1994): we do not know if the findings from this inquiry can be generalized to a larger population. The value of the research instead lies in its ability to provide insights through rich detail, and to provide directions for future inquiries.

Case-study: The Derby projects at WaterCo

UtilityCo is a leading environmental services group providing water, waste and utility services. The group has a turnover of £1.8 billions and employs over 14000 people in the UK, US and Europe. WaterCo is the group’s regulated water business. It has a turnover of 900 millions (2002). It provides water and sewerage services to over three million households and businesses in England and Wales. WaterCo is the group's largest operation and one of the UK's leading water and sewerage companies. Serving over eight million people, it supplies nearly two billion litres of high quality drinking water every day through 43,000 km of water mains.

The case focuses on the first phase of a completed 30-month, £ 30 million project set up to replace filter beds with new activated sludge plant complete with new sludge treatment facilities at a sewage treatment works in the Midlands region of the UK. The site at Derby was a high profile environmental problem and the works required a significant amount of asset renewal. The machinery was at the end of its working life and thus its reconstruction had very significant planning and environmental aspects.

Phase one of the Derby project started in August 1999 and finished in February 2002. The project was originally designed as a two-phase programme but phase two was subsequently divided into two further phases in order to capitalise on the experience and benefits of scaling work and learning along the project development.

The project was original in many respects. Although there were three other major sewerage treatment works reconstruction programmes completed or nearing completion at the time of the project's inception, none of them was comparable in terms of the level of investment, timescale, dedicated staffing and site organisation. This particular project was the only one that was approached in this way.

Firstly, with an estimated £60 million investment by the time of its completion, the project was the largest capital scheme in the firm's development programme – projects being usually around £500,000 to £2m in size. Secondly, the timescale was very demanding and the feasibility work, planning applications, assessment and site investigations had all to be done at the same time rather than sequentially to meet the ambitious deadline set by one of the directors doing the undertaking that it would be built by 2002. Thirdly, the core team was co-located on site together with the main contractor. This, together with the shared extended responsibility over the final detailed design, gave the core team a certain amount of autonomy and independence from the main office nevertheless situated just across the road from the site. Fourthly, the project benefited from a specialist, dedicated team brought in by other teams. This team assemblage was not only specific but also dedicated to the scheme only. Finally, the project was unique in its combination of civil engineering works with complex mechanical and electronic tasks supporting an improved water treatment process. Project activities ranged from building a bridge over a river through to land remediation, additional infrastructures and sophisticated software control systems.

The project was characterised by the implementation of a procurement strategy that implied the development of a much more integrative approach to design, procurement and construction with the principal contractor. This in itself can be seen as an example of project-based learning. In previous schemes most of the design work was done up front, and tenderers based their tender on the detailed design provided by WaterCo so that solutions were definitive and largely based on single-sided internal understanding of project issues, technical expertise and approach to project management. While phase one was procured the traditional way (with most of the design solutions frozen at the tender stage), phases two and three were procured with a single one-off lump sum with only an outline design - the detailed design would come based on that, once the tender had been awarded. This new form of procurement thus left much more room for collaborative work, shared ownership and cross-fertilisation between partners. Client and contractors could then develop the detailed design together to

optimise both the technical solution and the cost. If the final price came below that price they would share the savings between them.

The project was supported by a team which included half a dozen UK leading engineering and architectural consultancies and contractors. The core team on site was made up of WaterCo and ConstructionCo staff, each supported by their own regional head offices and their network of contractors and suppliers. WaterCo involved four main functions: asset procurement and investment, engineering, user and technology and development. The core team was deliberately made of experienced specialists because the timescale did not allow the project to be used as a learning ground for less experienced staff. WaterCo's team on site was lead by the Site Reconstruction Manager, someone with extensive experience of both sewage treatment works within WaterCo and the site itself, having been with WaterCo for more than 25 years. Other WaterCo team members were all cherry-picked experienced specialists, with no other commitment but this project. WaterCo brought about 20 people on site and ConstructionCo about 40, their largest project so far. ConstructionCo actually set up a water division specifically to work on the project, recruiting both internally and headhunting in the industry, e.g. phase one's Project Manager who had project-managed similar WaterCo projects on behalf of a different contractor.

WaterCo successfully redeveloped its water treatment works on time to new specifications and to a much tighter standard. This could not have been achieved without significant effort in developing new practices. Learning in phase one was essentially driven by the need to redevelop the facilities to meet new environmental expectations so that lessons learnt were essentially technical in nature (chemical dosing system, tank water tightness, water pump management, etc.). However, the successful development and re-deployment of these lessons was largely supported by innovative organisational and processual approach to contract procurement and development. Although this was meant to be done essentially internally by the core team, inspiration was drawn from recently completed schemes, not only by a need to capitalise on, and benchmark, relevant internal experience but also by the need to improve it. Inspiration from outside the company was driven by the need to overcome some the technical problems faced by the process solutions (chemical dosing systems) developed by one of the benchmarked sites.

In the early stages, the core project team relied on the benchmarking of internal practices, building on their knowledge of relevant schemes, knowing that experiences from similar schemes would be valuable and internal expertise could be tapped into so as to develop the foundations for a successful development of the project. This initially relied on benchmarking of previous proprietary schemes (visits to three water treatment works in the Midlands) and then potential contractors or tenderers for technical and organisational aspects with the benefits of the insights from the three previous proprietary schemes comparable in size and scope: *"We positively sought learning from others we knew to have done similar jobs"* (Site Supervision Team Leader)

Based on these insights, a decision was made by the Site Reconstruction Manager to reorganise and co-locate all core elements of the project (design, construction and contract administration team and a site supervision team) on site with contractors. The benefits of this approach were not obvious from the outset because of the novelty of the arrangements for both parties and the limited interaction required in the early stages. As outlined in our analysis below, however, the benefits became obvious when the team began to collaborate

more systematically on design issues.

Analysis

In analysing the case, we will focus initially on the role of absorptive capacity in creating the conditions for project-based learning. This role seems to have been multi-faceted. In the early stages of the project, the project team were able to draw on the existing functional capabilities of the firm. Thus, rather than seeking out external expertise from contractors and suppliers, the project team initially sought expertise from within, either at the team level or within the organisation as a whole. The latter involved, for example, the benchmarking of previous site redevelopment projects. The project was thus able to draw on in-depth prior knowledge which was readily available via the firm's highly differentiated structure. As the contract administrator noted;

'Nowadays people tend to specialise more. There is a group down in Alpha House specifically to deal with sludge plants. We are developing one now for a scheme up in Mansfield, so what we are doing is drawing on their experience.'

However, the availability of prior knowledge was also seen as inhibiting the impetus for learning at project level, encouraging the project to remain within the boundaries of proven solutions. As the contract administrator commented:

'I think it would be fair in saying that Severn Trent water is fairly conservative in its ideas. It likes to have simple solutions that it knows are tried and tested solutions. So we tend to use the ways that it has been done for a long time.'

The implications of functional specialization were also experienced more negatively as the project began to develop. Project members spoke of the 'silo mentality' resulting from specialization and its damaging effects on collaboration. As a project manager put it; 'if the different disciplines do their work correctly and then it doesn't fit together, it doesn't work'.

Finally, in relation to the generalization of project-based learning to the rest of the organization, the absorptive capacity defined by existing structures again seems to have had a generally constraining effect. To a large extent, learning was localized within the project team;

'Most of what we are learning is specific to that site and specific to the sewerage that Derby receives. So most of it we can't learn anything that is going to be of use to anybody else....And so most things are dealt with, done and dusted and got out of the way, and nobody gets to hear about them.' (Design Manager)

In contrast to absorptive capacity's constraining effect on project-based learning in this firm, the development of reflective practices seems to have been a vital ingredient in stimulating such learning. Our analysis of the emergence of reflective capacity within the Derby projects, however, highlights a number of factors which have not been addressed in previous studies. These include, firstly, the importance of the relative isolation and autonomy of the projects. The deliberate decision to sever almost all relations with the office seems to have encouraged the site team to develop their own routines. This helped to overcome some of the

restrictive effects of functional specialization as problems could be solved in an integrative way:

'In large part we paddle our own canoe with design and development and construction just to get things done...I think we made our own rules on a lot of what we did here.' (Site Supervision Team Leader)

Relative autonomy for the project was associated with the co-location of project participants. Relationships improved significantly once the different teams moved onto the same site:

'There is much more exchange of information with the contractor, there is much more openness in all manner of areas. In part that is because we have been sharing the same office for three years and there is a degree of trust built up and there is a good relationship there.' (Site Supervision Team Leader)

The relative autonomy of the project was also important in creating perceived incentives to learn as a team. Learning was immediately applicable to the team's environment and assignment. However, a further inducement to learning was the unusual linkage between the Derby projects. This linkage was partly defined by the benefits attached to the new procurement contract based on a pain/gain mechanism with contractors and full partnership arrangements. This created shared goals between the parties:

'Any problem that comes up, then there's that common goal of 'let's make the decision quickly to solve it and let's make it with the least cost in mind', so it's the shortest time to avoid delay to the job and a least cost option to achieve the objective. That means that people have the same objective rather than the opposite. In the old way of working we would try to maximise value and they would try to minimise it across the project, so you're working against each other.' (Principal Contractor's Project Manager)

This formal relationship underpinned the level of trust which had developed through collaboration:

'In phase 2 the relationship is a very mature relationship – a high level of trust. People understand exactly what we're trying to achieve in terms of quality. There's no hidden agenda.' (Principal Contractor's Project Manager)

The linkage was also sustained through continuity of project membership, which encouraged team members to identify and retain learning:

"(...) it will be the same teams again but you are using the same contractor the same design team so that they are learning the lessons. Rather than the lessons being disseminated to everybody the lessons are being kept very much within that team" (Design Manager)

Moreover, in cognitive terms, the expectation of continuity also created a greater future

orientation in relation to project work.

“It was so obvious that we had to learn from what had gone on before because it’s quite unique for the same team to stay together and to build practically a repeat of what we’d just built” (Principal Contractor’s Project Manager)

Discussion

Our analysis of the Derby case has highlighted the implications of both absorptive capacity and reflective capacity for the development and generalization of project-based learning. We noted that, in this functionally differentiated setting, absorptive capacity tended to inhibit both the development and generalization of project-based learning. This was in part because learning could be avoided by drawing on existing expertise, but also because the learning generated within the project could not be easily related to the activities of the functional specialisms.

It seems significant, however, that the inhibiting effect of structural differentiation was reduced when project members were co-located and the projects secured greater autonomy from the mainstream organization. At this point, it seems, the diversity of perspectives applied by project members no longer operated to constrain learning but rather to stimulate it. This physical separation was reinforced by, firstly, the development of contractual arrangements which enabled shared goals to be identified, and, secondly, the relational effects of collaboration which engendered greater trust.

These social and cognitive consequences of each project’s organizational positioning, however, also need to be related to the motivational effects of positioning in relation to other projects. The perceived linkage between the different projects derived from relative continuity of tasks and project membership. In a complex inter-organizational setting, such continuity helped to create an important instrumental benefit from the pursuit of learning – the opportunity to apply such learning, *and appropriate the benefits*, across subsequent iterations. Awareness of this opportunity helped to reinforce trust-based social relations. In cognitive terms, it helped to create a future-orientation amongst project members that extended beyond the immediate project deadline. This seems to have been important in overcoming the inhibiting effect which project pressures typically exert on reflective practices.

This motivational feature of project linkage can be usefully contrasted with other studies which have highlighted the positive effect of temporal boundaries on the development of reflective practices. The present study suggests that the effect of such boundaries on learning is mediated by the positioning of projects in relation to each other. In short, the most favourable conditions for reflective practices may not be the one-off project, but rather projects which are linked socially and practically. Here the effects of diversity and project deadlines may be accentuated by additional motivational features linked to sharing the gains of project-based learning.

Finally, it is important to note that while the development of reflective capacity and learning was enhanced by the relative autonomy of the projects in our case, the organization’s ability to generalize that learning was thereby reduced. The greater the development of, and identification with, the Derby projects as a semi-autonomous activity, the fewer the

interactions with the wider organization which might have enabled the generalization of the learning which was produced.

Conclusions

This paper has highlighted the role which absorptive capacity and reflective capacity respectively play in the development of project-based learning. A review of the experience in one case-study highlighted the limitations which structurally differentiated forms of absorptive capacity place on both the development and generalization of such learning. The pre-existing distribution of specialized knowledge was seen as reducing the need for learning in the initial phase of the project. In subsequent periods, while learning was stimulated by the project environment this was the result of projects securing greater autonomy from the bodies of specialized expertise. Such autonomy enabled the development of project-specific learning amongst members of the project teams. At the same time, greater project autonomy reduced the possibility of the re-absorption of learning from the projects.

In contrast to the constraining effect of absorptive capacity, the development of reflective capacity on the part of project members was seen as generally contributing to the experience of learning at a project level. Conditions for the development of such reflective practices were identified as the relative autonomy of project work, co-location and socialization of project teams, and the sequential positioning or batching of the projects concerned. The latter, which was reinforced by continuity of personnel and developments in contractual arrangements, was important in creating a time-orientation that extended beyond the deadlines of the immediate project. This extended view promoted a perception of the shared gains which might be secured through the identification and application of learning.

In terms of specific interactions between absorptive capacity and reflective capacity, our study suggests that the structural differentiation of prior knowledge may operate positively in relation to the development of reflective practices by sustaining diversity of perspectives. This positive effect, however, depends upon project members from different functional and organizational positions developing a future-centred time orientation to their work, social relations based on trust, and a commitment to shared goals. As noted above, we found that these social and cognitive factors were enhanced by the linking of projects in sequence. This pattern encouraged the development of reflective practices by providing opportunities and gains from the application of learning. The more hermetic the relation between the projects and the wider organization, however, and the greater the learning developed within that locus, the more problematic became any attempts to generalize it to the rest of the organization. In this sense, absorptive capacity and reflective capacity may be seen as operating to some extent in opposition to each other.

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