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The Investigation of Mutual Relations of Success Factors of Knowledge Management in Project-Centered Organizations

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ABSTRACT

The prevalence of temporary forms of cooperation and project- based work is increasing. Likewise, he knowledge –intensity of work contents is growing. However, the unique and temporary nature of projects and program does not support knowledge transfer from, between and within project.
This research aims at spotting success factors of knowledge management in Project-Centered organizations. Based on a cross-industry sample with 250 project management, we apply the partial least square (PLS) method to test the influence of cultural, organizational, structural, and process-related factors on knowledge management effectiveness. Besides IT-support and formal elements of the organization, it is cultural factors that strongly influence knowledge management success. In project-based organizations they compensate for the lack of organizational routines and memory. Our results contribute to a more differentiated understanding of knowledge management in project environments.
KEYWORDS*:* Knowledge, knowledge Management,organizational learning, project, project knowledge.

INTRODUCTION

The increasing importance of knowledge emphasizes knowledge relationship like vital resources in the form of reflected theoretical methods. Knowledge oriented view of some firms necessitates the integration of science and capability with personal knowledge which is a key component in accomplishing tasks successfully and developing positive competitive atmosphere **(Linder,Wald,2010,1)**.

Project management regulations are not only necessary for industry-based projects such as construction, management consultancy, film making and software engineering, but also are important for a number of other industries where projects run to develop products and services and create organizational changes**(Demerest,1997,380)**. Knowledge management is the process of developing, confirming, delivering, distributing and applying the knowledge. It is not a simple question about storing, retrieving and transferring information but is more the interpretation and organization of data in some other ways**(Butt,1381,380).** Knowledge management challenges are investigated and analyzed in project-based organizations and results showed that individual limitations are available in short-term in such organizations. When the project is finished, individuals who have worked together solve and separate project knowledge. Permanent organizations in which parts and sections act as knowledge silos are in contradiction with temporary organizations where, routinely, organizational cycle (organizational memory) comes out**(Brookes,2006,2).**

In project organizations, that are considered temporary organizations, there exists no proper mechanism for gaining, storing and propagating the knowledge and, also, for organizational learning (**Linder,Wald,2010,2**).

Many studies have shown that knowledge management problems are mostly seen in project organizations. According to case studies and qualitative investigations, knowledge management bodies are examined in individual firms, industries and different types of projects. These investigations identified some successful factors and a number of limitations for knowledge management among various projects. In fact, these results are based on relatively small samples, individual cases and certain industries and projects and this makes it impossible to generalize them. The present paper aims to identify and success factors of knowledge management in temporary organizations based on a general experience**(Hanisch,2009,3)**. There are some factors, in planning and implementing project organizations, which are more important and vital than others. This article tries to introduce success factors of knowledge plans and their components. The aim of this study is to simultaneously analyze knowledge management success factors and the mutual relationships of these factors in project-base organizations. To do so, we seek experimental evidence using big samples, control of possible

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industrial effects and project specifications. Therefore, this question is asked: What are knowledge management success key factors in such organizations? We considered the relative importance and mutual relationships of various success factors of previous studies. Indeed, most general forms of temporary organizations focus on project knowledge management plans and projects.

This article organized following cases:

In the following section we investigate the conceptual base of knowledge management in project-based organizations. Then, we provide an overview of previous studies on project knowledge management, develop the research model and form our hypotheses. Afterwards, research methodology is described based on experiment and experimental results are presented and discussed. Finally, we run project knowledge management using a summary of findings and consequences.

Knowledge Process and Project Knowledge Management

Knowledge is a main resource in modern organizations. It is considered as personal feeling (understanding), experience and skill**(Kshinen,2004,3**). Knowledge act really skillfully and probably defines the situation for a skillful action. Individual perspective of knowledge is relevant to organizational level **(Nonaka,2009,6).**

Knowledge process involves several steps:

First, knowledge production leads to use, transfer, divide, store and reinforce the knowledge **(Schindler,2003,223).**

To convert implicit knowledge to an explicit form is the most difficult step in organizational knowledge process. Implicit knowledge, as a description of useful experiences recorded and placed in the network, is comparable to direct understanding, experience and internal conception (**Akhavan,Hosnavi,1389,54**). Explicit knowledge is presented in the form of a sentence and its general characteristic is that it is accessible through consciousness. Basic explicit knowledge completes organizational knowledge**(Nonaka,2004,4)**. Knowledge management is the process of production, distribution and implementation of knowledge in order to achieve organizational goals**(Saremi,Danesh,2011,250)**. Project knowledge facilitates knowledge transfer in projects and among organization's permanent and temporary sections. Quality confidence based on knowledge profitability, correctness and being just-in-time is the most important part of project knowledge in an organization **(Du plessis,2007,8)**. Knowledge management provides the organization with organizational learning and results in gaining more economic profit through the wide use of information technology, process improvement, suggesting new methods and using others' experiences **(Kalseth,1999,10).**

Organizational learning hides in the nature of knowledge management. After the definition of some basic concepts such as knowledge, knowledge management and organizational learning, this learning hides in the essence of knowledge management and the role learning plays in the structure of organizational long-term performance. Knowledge is prior in learner organizations and management main responsibility, in the information era, is to develop new capacities required for continuum learning **(Bennt,2003,13)**. Projects and plans are organized as temporary forms which possess certain features and impose specific challenges on project knowledge management **(Fong,2005,13)**.

1. Proprietary and temporary projects inhibit emersion and development of organizational uniformity and thus prevent organizational cycle and learning.
2. Working capacities and integration of discontinuous groups leads to exclusive experiencing and separation of organizational knowledge **(Podsaakoff,2003,11).**
3. Despite permanent organizations, projects are deficient in natural learning mechanisms. Therefore, it is difficult to transfer knowledge from a project to other permanent sections of the organization. Deficiency in learning mechanism disperses geographical projects and intercultural project teams **(Boh,2007,20).**
4. Projects are relatively short-term but knowledge management requires a long-term view. There is often a delay between the first investment in knowledge management system and invest feedback. These contrasts result in transfer of knowledge inadequacy among projects.

A particular feature of all projects and plans is that they justify knowledge management in establishing temporary organizations. Knowledge management in project-based organizations includes a variety of knowledge types which relate to special knowledge management among temporary and permanent organizations. Project knowledge implies the project view in the organization. The knowledge of local projects clearly relates to project management methods and operations in the project. Transmission from temporary organization to a permanent one may help the basis of organizational knowledge.

Key Factors of Knowledge Management Success

Various studies have tried to identify key factors of success. In one of these studies, "Akhavan, et al" (2006) investigated and identified a set of success key factors for those organizations which try to design and implement knowledge management. These factors are identified through a multi-case study. In this research, six well-known firms (e.g. Ernest Young, Microsoft, TelTech,…) were selected. These firms were successful in knowledge management and their information was gathered from articles, journals, books, reports and the Internet. 16 factors were identified by analyzing these firms. Some of these factors include: organizational culture, senior manager's commitment, knowledge guideline, organizational structure, knowledge sharing. "Hariharan" states that many knowledge management projects fail in practice. The survey of "Mc Kenzi" is an evidence for this statement. The survey is accomplished among 40 American, European and Japanese firms. Many senior managers believed that knowledge management is just an advanced information system. Relevant plans must possess horizontal relationships in all organizational levels to ensure success in knowledge management. These relationships range from business need to improved processes supported by human factors and proper technologies. In 2007, "Tat and Hase" considered three key subjects in implementing knowledge management. These subjects include: employees' understanding and conception from knowledge management, definition of those goals which refer to the understanding and strategic significance of knowledge management as a working material, and executive operations which try to support organizational goals following knowledge management empowerment. "Martinez, et al" believe that organizational culture and leadership are two important factors affecting the success of knowledge management plans, despite the fact that many knowledge management projects start their task by presenting technological solutions.

A recent study in this context introduced factors of knowledge management success in temporary organizations. This research classified some certain determinants: culture, organizational learning, structure theory, project management, ICT, etc. are main factors in it **(Linder,Wald,2010,4).**

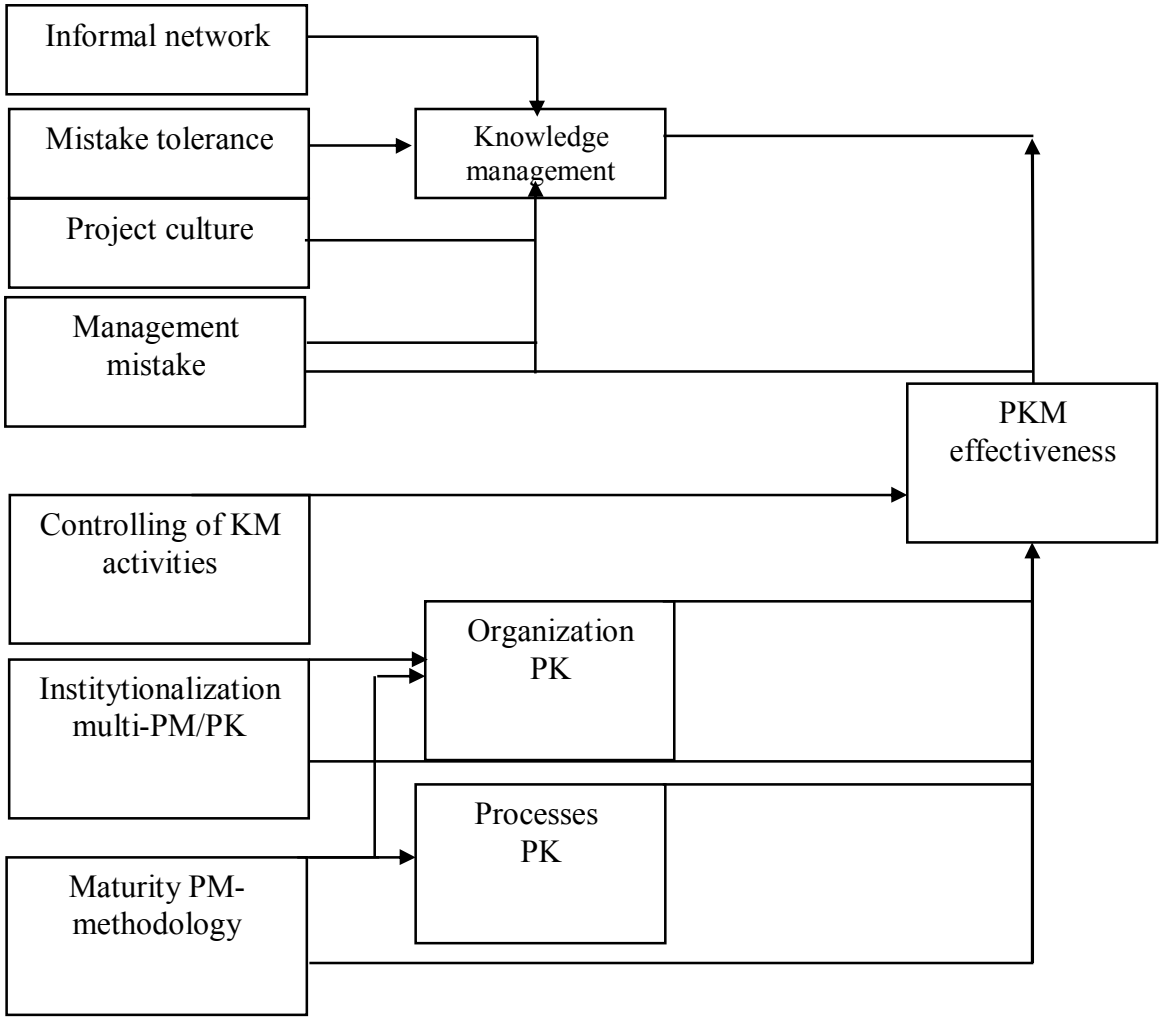
Table 1: Knowledge Management of Success Factors (Okunoye,2003)

Writers	Teach	Knowledge generation	Technology Infrastructure	Management support	Knowledge dissemination	Knoledge culture	Knowledge exchange	Knowledge leadership	Knowledge Infrastructure
Busy	*		*				*		
Scaiermeh	*			*		*	*	*	
Still			*	*		*		*	
Hakcell		*					*		
Liebowitz			*	*		*	*	*	

Conceptual Model (Theoretical Framework) Development

In general, what is concluded form available theories on knowledge management success factors is the most important concern about effective implementation of knowledge management including various human aspects and a great deal of success factors is relevant to these factors. In other words, although technical elements and technological infrastructures are required to manage knowledge in organizations, but the effectiveness of some factors (such as organizational culture, respecting individuals, knowledgeable leadership, etc) indicates the critical role of human factors. Investigating previous studies, aspects such as ICT, formal procedures, structures and methods along with smoother factors such as social and cultural capitals are considered and some of these success factors of knowledge management in projects are identified by leading case studies and perfect research. In our model key factors of knowledge management success in project-based organizations are explicitly introduces and simultaneously their relationship with project knowledge management effectiveness is analyzed while previous studies mentioned in this paper did not do so. They only investigated the organization and identified key factors of knowledge management success but, respecting previously mentioned factors, the present article justifies them simultaneously for project knowledge management effectiveness. Success factors of knowledge management for project implementation lead to project knowledge. The harmony of formalized learning processes is of great importance for project methodology and goals. According to accomplished analyses, in this research we introduce culture and communications, methods and organizations as main categories of knowledge management success in project-based organizations and consequently apply project knowledge management knowledge management production to develop research model.

Fig1. Research model



Research Hypotheses

According to research model knowledge management key factors are categorized into two classes:

1. Organizations and processes
2. Culture and leadership

Knowledge management structure belongs to the category of organization and processes and informal aspects of social and intellectual capital are assigned to the class of culture and leadership. These factors directly affect the success of knowledge management. But success factors are interdependent themselves. The dependent variable of the present research is project knowledge management effectiveness. This effectiveness shows advantages gained from producing, storing, retrieving and transferring project knowledge.

1.Organizations and Process

Five main factors are available in this class: the process of project knowledge management, project knowledge management of the organization, maturity of project management methodology, institutionalization of project management with knowledge management in a multi-project environment, management operations control. We predict that there is a positive relationship between project knowledge process and project knowledge management effectiveness.

1-1. Systematic processes of project knowledge have a positive effect on project knowledge management effectiveness.

1-2. Organization project knowledge has a positive effect on project knowledge management effectiveness.

1-3. Maturity of project management methodology has a positive effect on project knowledge management effectiveness.
1-4. Maturity of project management methodology has a positive effect on project knowledge management organization.
1-5. Maturity of project management methodology has a positive effect on project knowledge management process.
1-6. Institutionalization of knowledge management / multi-project management methodology has a positive effect on project knowledge management effectiveness.
1-7. Institutionalization of project-based management has a positive effect on project knowledge management organization.
1-8. Maturity of project management methodology has a positive effect on project knowledge management effectiveness.
1-9. Evaluation and control of knowledge management operations have a positive effect on project knowledge management effectiveness.

2.Culture and Leadership

Most of general literature on knowledge management has identified knowledge as the legal element of knowledge production and allotment **(Ajmal,2008,10).**

There are five main factors in this class which are positively related to project knowledge management effectiveness: knowledge culture and management commitment which directly affect the project knowledge management effectiveness, and project culture, mistake tolerance and informal networks with indirect effect. Knowledge culture relates to transmission of open knowledge inside and among projects and depends on individual trends to distribution of knowledge and mutual trust. The culture of mutual trust and understanding personal and organizational advantages of project knowledge management is considered as a standpoint to facilitate the activity of potential project knowledge management users **(Koners,2005,3).**

2-1. Knowledge culture has a positive effect on project knowledge management effectiveness.
2-2. Management commitment affects project knowledge management effectiveness.
2-3. Management commitment affects project knowledge culture.
2-4. Mistake tolerance affects knowledge culture.
2-5. Project culture affects knowledge culture.
2-6. Informal network has a positive effect on knowledge culture.

RESEARCH METHODOLOGY

Respecting the accumulation of awareness and scientific facts, no deep progress occurs in science without developing proper hypotheses. With lack of leading thoughts we do not know which facts we are to collect and it is not possible to recognize relevant and irrelevant tasks **(Khaki,1382,204)**. The status of hypotheses must be clarified without any uncertainty and finally they are rejected or confirmed in a scientific test. For the sake of hypotheses testing we use consensus and sampling **(Hooman,1383,121).** The present research uses questionnaire as its data gathering tool and the target group is composed of project managers, project employees and the department of project management administration. The questionnaire was given to 250 individuals of whom 181 responded completely. The questionnaire was available in both paper and Internet forms. Research samples involve organizations with various size and industry (5 organizations). All samples were measured using Likert 5-point scale. In some questions, some predetermined measure items were applied which have been used in previous experimental studies. Measures were modified and defined in a new way for some structures. To test validity and reliability the first copy of the questionnaire was sent to 15 individuals who coordinated in some way (this copy was considered as pre-test). The second copy was edited to form the final questionnaire. In the final edition dependent and independent variables were defined precisely, ambitions were clarified and questions were tested as much as possible. All variables (dependent and independent) were gathered in a same questionnaire since separate collection of variables decreases the structural reliability. Knowledge management effectiveness structures, users' satisfaction and knowledge management systems were used to test the dependent variable (project knowledge management effectiveness). We identified this dependent variable as command structure of second reflection to increase its reliability and validity. This structure is specified with two aspects and each aspect with three items. "Youvonty" test was used in this research to control unfounded responses. We compared primary responses to next ones. We assumed that the group of next responses is similar to unfounded response group. Moreover, paper-base responses were compared to Internet-base ones and found unimportant differences for both groups.

Research Findings

Research results were tested with structural equation models. The correlation between structures was calculated through average variance. In order to measure structural reliability the square of structure must be greater than correlation coefficient of any structure in the pattern. Considered alpha for this research was 0.01 and if calculated P is smaller than the alpha, then the test is significant and meaningful. Data was analyzed using PLS (Partial Least Square) software package. PLS adopts a partial perspective for approximation and does not require sample size very much. Here, multiple paths among indicators, hidden structures and lost values are less applied. PLS software demonstrated that:

55.6% of differences were because of project knowledge management effectiveness, 54.3% because of knowledge culture, 21.2% as a result of organization's project knowledge and 22.3% for project knowledge process.

Only one of 15 determinant structures was not meaningful and one structure had weak effects (P>0.01). Besides, one structure was meaningful at a level lower than 0.05 and other structures showed meaningful effect at the level of 1%. Dependent variables in the model help to explain project knowledge management effectiveness and to evaluate various variables, both directly and indirectly. Most effective factors on project knowledge management effectiveness include knowledge culture, multi-project management, multi-project management administration and project knowledge proces

According to above tables, Path Coefficients of the dependent variable (project knowledge management effectiveness) with each independent variable include: 0.10 with knowledge management, 0.11 with institutionalization of multi-project management, 0.13 with organization's project knowledge, 0.19 with knowledge process, 0.15 with management commitment, 0.22 with knowledge culture and 0.08 with maturity of project management methodology.

Path Coefficients of knowledge culture with various factors include: 0.18 with project culture, 0.28 with informal networks, 0.26 with mistake tolerance and 0.27 with management commitment.

Path Coefficients of organization's project knowledge include: 0.04 with maturity of project management methodology and 0.47 with institutionalization of multi-project management.

Path Coefficients of project knowledge process include: 0.30 with maturity of project management methodology and 0.36 with institutionalization of multi-project management.

Table 2. Research Findings

Exogenous variable	Endogenous variable	Path-coefficient	t-value	Level of significance
1.Controlling of KM activities		0.10	2.30	***
2.Institutionalization multi-PM/KM	PKM-effectiveness	0.11	1.84	**
3.Organization PK		0.13	2.50	***
4.Processes PK	R2=55.6%	0.19	3.49	***
5.Management commitment		0.15	2.40	***
6.Knowledge culture		0.22	4.67	***
7.Maturity PM-methodology		0.08	1.3	*
8.Project culture		0.18	4.13	***
9.Informal network	Knowledge culture	0.28	7.34	***
10.Mistake tolerance		0.26	5.06	***
11.Management commitment	R2=54.3%	0.27	6.23	***
12.Maturity PM-methodology		0.04	0.41	ns
13.Institutionalization multi-PM/KM	Organization PK R2=21.2%	0.48	9.34	***
14.Maturity PM-methodology		0.30	6.41	***
15.Institutionalization multi-PM/KM	Processes KP R2=22.3%	0.36	8.11	***

Conclusion and Suggestions

Intensity enhancement of information for business planning and working content increases the need to knowledge management in project-based organizations. Although available investigations specify multiple success factors for project knowledge management, but focus on project samples limits the generalization of results, yet the relative importance of various factors and their mutual relations have not been investigated properly. Therefore, we, in this research, simultaneously studied effective factors on project knowledge management effectiveness in a big pattern such as in big industries and various project samples.

Knowledge systematic processes have a significant relationship with project knowledge management effectiveness (hypothesis 1-1). Most of these activities in permanent organizations are accomplished through routine tasks but project-based organizations lack these forms.

Organization's project knowledge has a direct relationship with project knowledge management effectiveness (hypothesis 1-2). In addition to systematic processes project knowledge can act to

facilitate knowledge transmission among projects and, also, among organization's permanent and temporary sections.

Maturity of project management methodology has a weak relationship with project knowledge management effectiveness (hypothesis 1-3). Project management methodology which is specified as the main framework of project knowledge management effectiveness is in contrast with previously studied research findings **(Hanisch,2009,10).** Completion of and organization's project describes the scope of project management methodology and its consistency and application.

Maturity of project management methodology has an indirect relationship with organization's project knowledge management (hypothesis 1-4). This is the only theory confirmed by our research. Since formalization of information management and implementation of project management methodology prevents individuals from effective exchange, store and retrieval of information**(Adenfeht,2006,5).**

Maturity of project knowledge management methodology has a positive relationship with project knowledge process (hypothesis 1-5). Since project management provides a set of permanent streams for integration of project knowledge in the project.

Institutionalization of multi-project knowledge management has a relatively positive relationship with project knowledge management effectiveness (hypothesis 1-6). The quality standard required for information management helps to avoid discrete and turbulent project environments.

Institutionalization of multi-project knowledge management has a positive relationship with project knowledge organization and project knowledge process (hypotheses 1-7 and 1-8). Not only has this factor directly affected project knowledge management effectiveness, but also directly organizes project knowledge management procedures and has a positive relationship with it. Institutionalization of duties and responsibilities in the form of project intense administration ensure continuity and professionalism and motivates users to participate in project knowledge management activities. Project management office links permanent and temporary sections.

Knowledge management operation control and evaluation have a positive relationship with project knowledge management effectiveness but is weak in comparison with other factors (hypothesis 1-9). Project knowledge management control supports organization and modification of investment and formation of knowledge management system and accepts them. Group performance evaluation is relevant to accumulation of knowledge goals for the sake of incentive plans. Control of project knowledge management operations results form strong measurements and participations and improvement of the quality of project knowledge management.

Knowledge culture has a positive and strong relationship with project knowledge management effectiveness (hypothesis 2-1). A set of values, trends and expectations of information speeds up people's tendency to share knowledge and the trust distributed by others. In our model, knowledge culture (the most important factor for explaining support for informal communications, mistake tolerance, project positive culture and commitment of senior managers) leads to information culture.

Management commitment has a positive relationship with project knowledge management effectiveness and, also, is indirectly related to knowledge management through knowledge culture (hypotheses 2-2 and 2-3). Managers' commitment not only provides a proper endowed resource for knowledge management, but also refers to employees' incentive to take part in project knowledge management. Managers' commitment is considered by project team members as a symbol assigned to another time and resource which legitimates knowledge management**(Akgun,2007,13)**. This commitment includes forming project supporting organization, representatives' board in which authorities of project knowledge management and project leadership are involved.

Mistake tolerance, project culture and informal networks have a positive relationship with knowledge culture (hypotheses 2-4, 2-5 and 2-6). In project-based organizations which, in fact, are formed based on temporary plans, culture can compensate for the lack of routine circumstances and organizational cycle**(Brookes,2006,2)**. Some effective factors on project knowledge management are adopted form previous studies and some others are gained form general investigations accomplished in permanent organizations. Some certain ones are of particular importance for project-based organizations. Specially, the effect of cultural factors on success of project management is identical to that of previous studies. In the present research, we extended knowledge management in project-based environments and showed that knowledge culture is the most important success factor in these environments since quality and usefulness are necessary elements. Another important success factor is to organize multi-project management, especially the role of project management office in expanding knowledge management. Besides, other factors such as project knowledge procedures and organizing project knowledge have a significant effect on knowledge management. In general, mutual relation of various key factors helps the successful transmission of information inside and among projects.

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