ICIM2007 Workshop
on Advanced Human Resources Cultivation toward Regional Innovation

ANA Hotel UBE

Ube, Yamaguchi, Japan

December 5, 2007

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Brief Overview of ICIM2007 Workshop on Advanced Human Resources Cultivation toward Regional Innovation

1. Background and Aim

This workshop is organized by Graduate School of Innovation and Technology Management, Yamaguchi University and takes place as part of the "promotion program for education in the professional graduate schools" of Ministry of Education, Culture, Sports, Science and Technology (MEXT) in FY 2006 and 2007. This workshop particularly focuses on the role of MOT (Management of Technology) education at rejuvenating and manufacturers and facilitating innovation.

2. Date and Place

- Date: Dec. 5, 2007, 12:50 – 14:50
- Place: ANA Hotel UBE, International Conference Room

3. Participating fee

- Free

4. Program

- Keynote Lectures (12:50 – 14:20, 20 minutes for each)
  - Yamaguchi University's Activities toward Advanced Human Resources Cultivation (*30 minutes), Prof. Kazuhiro Fukuyo (Yamaguchi University)
  - Perspective about MOT Education Based on Chinese Case Study, Prof. Xie Kefan (Wuhan University of Technology)
  - Importance of Open Innovation and Alliance Strategy, Prof. Geert Duysters (UNU-MERIT)
  - E-Communication Technologies in Project-Based and Traditional Organizations, Dr. Maqsood Sandhu (Swedish School of Economic & Business Adminstration)
- Panel discussion (14:20 – 14:50)
  - What kind of skills and ways of thinking do we teach for facilitating innovation?
  - How to teach necessary skills and ways of thinking?

Biographical Notes of Speakers

Kazuhiro FUKUYO,

Dr., Associate Professor, Graduate school of Innovation and Technology Management, Yamaguchi University (YUMOT)

Kazuhiro Fukuyo is an associate professor of the Graduate School of Innovation and Technology Management, Yamaguchi University, Japan. He received his doctoral degree at Osaka University. After working at Hitachi Ltd. as a researcher, he became a lecturer of the faculty of engineering, Yamaguchi University. He works at the current organization, i.e., the Graduate School of Innovation and Technology Management from 2005.

His specialty is the management of technology, energy management, and environmental engineering. He published over 40 research papers and was awarded by the Society of Heating, Air-Conditioning and Sanitary Engineers (SHASE) of Japan in 2001.

XIE Kefan,

Dr., Professor, Deputy Dean of the School of Management, Wuhan University of Technology (WHUT)

Dr. Xie Kefan is a professor and deputy dean of the School of Management, Wuhan University of Technology (WHUT), China. He is the director of Risk Management Institute of WHUT, and the deputy director of Science and Technology Innovation Research Center of WHUT.

He also serves as the research fellow and visiting professor of several universities such as Fuzhou University, Zhejiang University, Wuhan University, and Shenyang University of Technology.

He is the president of Science and Technology Management Research Association of Hubei Province, and the deputy president of Wuhan Systems Engineering Association. He is the associate chief-editor of Journal of Wuhan University of Technology-Social Science Edition. He is also an executive board member of BOYUN Corporation.

Dr. Xie Kefan got his PhD at WHUT in Management Science & Engineering in 1997. He was a visiting scholar at Economics Department of Kyoto University from 1998.10 to 2000.9.

His research interests focus on Innovation Management, risk management, and strategic management.

He has published over 40 papers about technological innovation risk. He is the associate Chief-editor of proceedings of the 2nd, 3rd, and 4th International Conference on Innovation & Management. He has published 12 books such as Management of Technological Innovation

Risk, Entrepreneurship Management of High-Tech Enterprise, Early-Warning Management of Marketing Risk, Risk Management of New Product Development.

He won the First-Rate Prize of China Reform Suggestion, and the China Best Paper Prize in Technology Economy.

Geert DUYSTERS

PhD, Professor, United Nations University, Maastricht Economic Research Institute on Innovation and Technology (UNU-MERIT)

Geert Duysters is an economist with a PhD in Economics and Business Administration. After working at the University of Maastricht as subsequently, researcher, assistant professor and associate professor he is currently employed as a Professorial Fellow at UNU-MERIT. He is also a part-time full professor of Organization Science at the faculty of Technology Management of the Eindhoven University of Technology. His academic research mainly concerns international business strategies, innovation strategies, mergers and acquisitions, technology catch up strategies of developing countries, network analytical methods and strategic alliances. He has published over 50 international refereed articles and book chapters. His interest in business strategies and innovation strategies is not only academic, as he worked for several years as a consultant (senior manager) for KPMG Alliances at the international headquarters in Amstelveen (the Netherlands). He also acts as a founding global board member of the Association of Strategic Alliance Professionals (ASAP).

Maqsood SANDHU

Dr., Swedish School of Economics and Business Administration (HANKEN)

Maqsood Sandhu is a Senior Researcher at the Swedish School of Economics and Business Administration in Vaasa, Finland. He received his Ph.D. in Entrepreneurship and management in 2005. He has been working as Senior Lecturer/ Researcher at the University of Vaasa and currently as visiting Professor in the same University. Sandhu has published over 10 articles in International Journals and about 30 research papers in international conference proceedings. Since completing an MSc in 1998, he has been working for five years in the multinational company Wärtsilä Finland Oy as Manager, Process Development. Currently, he is interested in doing research in the areas of project management, supply chain management and operations development.

Yamaguchi University's Activities toward Advanced Human Resources Cultivation

Kazuhiro Fukuyo
Graduate School of Innovation and Technology Management, Yamaguchi University
(E-mail: fukuyo@yamaguchi-u.ac.jp)

Contents

- Introduction
- Yamaguchi University's Activities
- Digital Engineering Education
- Teaching and Evaluation Methods
- Conclusion

Introduction

The cabinet decided the "Basic Policies for Economic and Fiscal Management and Structural Reform 2006" on July 7th, 2006. These policies were presented by the "Council on Economic and Fiscal Policy*".

The "Basic Policies" pointed out a variety of issues confronting Japan, e.g., intensification of international competition, fiscal deficits, acceleration of demographic aging, and varying levels of domestic inequalities (i.e., (1) the regional imbalances, (2) inequality in education levels, and (3) inequality in job opportunities). Among the many approaches to these issues, the followings are related to management of technology (MOT):

- Enhancement of international competitiveness
- Improvement in productivity by introducing information and communication technology (ICT) and/or shifting to service industry

* The Council on Economic and Fiscal Policy was established in the Cabinet Office as part of the reorganization of central government ministries on January 6, 2001, with the purpose of fully demonstrating the leadership of the Prime Minister, while reflecting the opinions of private sector experts in policy formation with regard to economic and fiscal policy.

The specific role of the Council is to conduct studies and deliberations and to present reports and opinions with respect to the following: (1) Important matters concerning economic and fiscal policy such as basic policy for overall economic management, fundamentals for fiscal management, guidelines for budget formulation in response to the inquiries of the Prime Minister; (2) and Important matters relating to economic and fiscal policy such as the National Comprehensive Development Plan with a view to ensure the coherency and consistency of policy in terms of the overall economy in response to the inquiries of the Prime Minister and relevant ministers.

In general, these reports are approved by the Cabinet and become basic policies of the Cabinet.

(Resource: Prime Minister of Japan and His Cabinet, http://www.kantei.go.jp/foreign/index-e.html)

- Vitalization of small and medium-sized enterprises (SME) in each region
- Establishment of education system to realize the society that offers chances to try again

The motive of this workshop, i.e., cultivation of human resources in each region, exactly treats these topics. In order to enhance the international competitiveness of Japan, various types of innovations, including the improvement in productivity by ICT, are necessary. However, innovations should be realized by the regional communities not the state according to the principle of "From the state to the regions[†]". The regional innovations will be driven by cultivating human resources capable of managing technologies, i.e., assessing the potential of technologies and developing them into businesses.

In this workshop, speakers will present advanced cases and ideas regarding the cultivation of human resources toward regional innovation. Professor Xie will present the perspective about MOT education on the based of Chinese cases. Professor Duysters will show the advanced ideas on the innovation strategy. Dr. Sandhu will indicate the importance of ICT on enterprises. The participants in this workshop may learn the cases and ideas and put them to good use.

Yamaguchi University's Activities

Graduate School of Innovation and Technology Management, Yamaguchi University (YUMOT) was established in 2005. It becomes a base of the MOT education in western Japan and is challenging to cultivate regional human resources. The followings are YUMOT's ongoing projects for human resource cultivation:

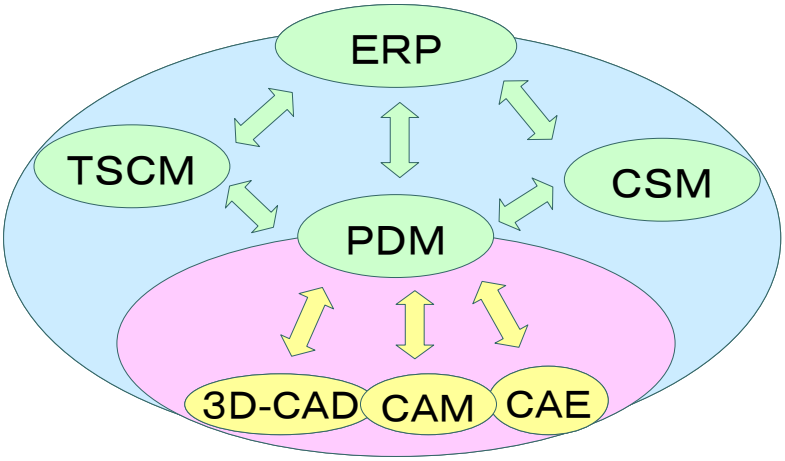
- Technology-management Education by Amalgamation of a University and Enterprises
  - Selected as the "Promotion program for education in the professional graduate schools" of Ministry of Education, Culture, Sports, Science and Technology (MEXT) in FY 2006 and 2007
- Systematic Education for Cultivating Regional Human Resource and Realizing Advanced Manufacturing using "Analysis-led design (ALD)"
  - Selected as MEXT's "Promotion program for education corresponding working people's needs" in FY 2007 – 2009

Of course, there are also many other projects for human resource cultivation, e.g., "Inland Higher Education Project in China" which is an international and interregional one and supported by Japan Bank for International Cooperation (JBIC). But I will explain the abovementioned projects in this workshop.

[†] Basic Policies for Economic and Fiscal Management and Structural Reform 2004 (Summary), (Resource: Prime Minister of Japan and His Cabinet, http://www.kantei.go.jp/foreign/policy/2004/0604kettei_e.html)

Digital Engineering Education

The abovementioned projects are related to the digital engineering (DE). DE is a general term of designing, manufacturing, prototyping, and analyzing technologies supported by ICT. Three dimensional computer-aided design, manufacturing, and engineering (3DCAD/CAM/CAE) systems are well-known DE tools. Representative DE tools and their relationship are shown in Fig. 1.



ERP: Enterprise Resource Planning, CSM: Component Supply management
TSCM: Total Supply Chain Management, PDM: Product Data Management

Fig. 1 Digital engineering tools

DE is now spreading globally for manufacturing high-quality, low-cost, and quick-delivery products. Introducing DE and constructing management system using DE is an urgent and crucial concern to survive against international competition. If many enterprises, especially SME, in a region introduce and make full use of DE and form an industrial cluster, the region will be vitalized and become a leading area in the world. Conversely, if enterprises avoid DE, they will be cut off from mainstream industry. Therefore, DE education, which makes managers of manufacturers be aware of the effect of DE on their businesses and makes technicians and engineers use DE tools powerfully, is necessary.

Education and Evaluation Methods

DE education can not be implemented by a university alone. Collaboration with regional institutions is necessary. Fig. 2 shows collaboration on DE education between YUMOT and the other institutions in Yamaguchi prefecture. Each institution teaches managers, technicians, and engineers depending on the degree.

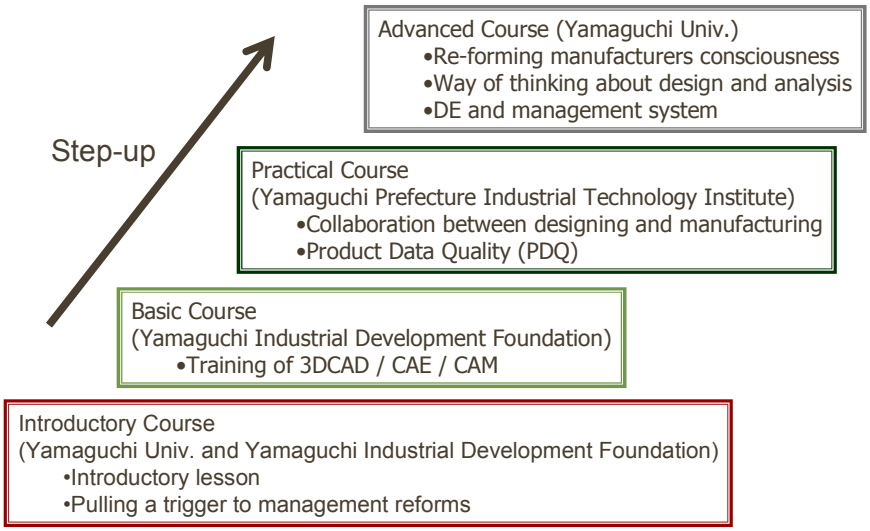


Fig. 2 Collaboration with Regional Institutions

Teaching methods for DE education are important issues. Mere dissemination of knowledge and skills doesn't reach to innovations. DE doesn't lead to management reforms if manufacturers don't understand the underlying philosophy as well as formal knowledge and technological skills of DE. New education system, in which manufacturers learn the underlying thought of DE from the job sites, is necessary. YUMOT thus apply "the remote lecture system by satellite, mobiles, and the internet", which was developed in FY 2005, to the DE education project "Technology-management Education by Amalgamation of a University and Enterprises".

By using the remote lecture system, classrooms in YUMOT can connect with the job sites of leading companies. Managers, technicians, and engineers of manufactures participating in DE education in YUMOT can discuss with the staff of the leading companies, extract tacit knowledge from "Living Education Material", and learn the way of thinking to full use of DE and improve their businesses.

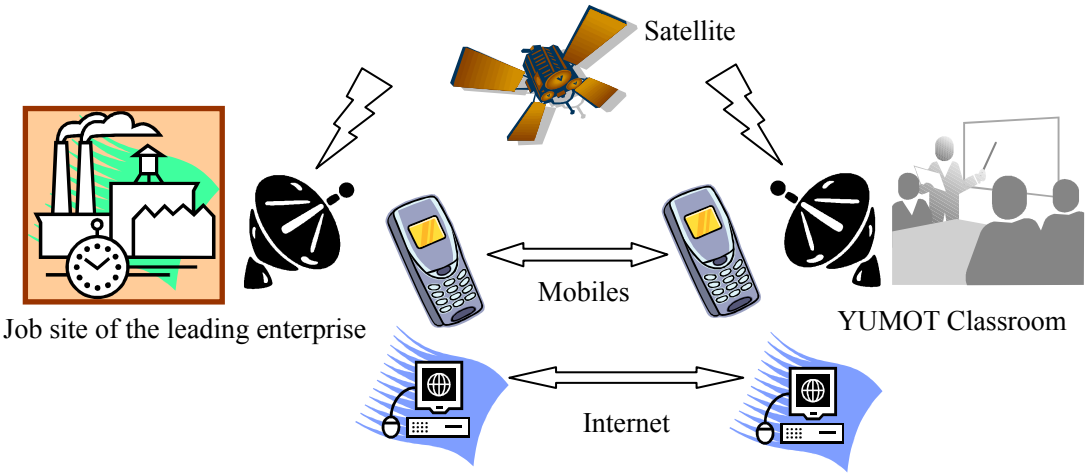


Fig. 3 Schematic of the remote lecture system by satellite, mobiles, and the internet

An example of "Collaborating Seminar" by the remote lecture system is displayed through the video (about 9 minutes).

Evaluation of the effect of DE education is also important issue. In the project "Technology-management Education by Amalgamation of a University and Enterprises", I used simple and practical evaluation method as follows: Students (managers, technicians, and engineers who participate in the program) declared states of the knowledge and awareness regarding DE before and after the DE education. The following four items are evaluated:

- Knowledge level regarding DE
- Knowledge level regarding 3DCAD
- Attitude toward introduction of 3DCAD / CAM
- Attitude toward introduction of DE technologies

Students declared the level of each item before and after the DE education. For example, the knowledge levels regarding DE are described as follows:

1. I don't know the word "DE"
2. I have heard of the word "DE"
3. I can explain DE
4. I can explain the technical and managerial significance of DE
5. I can explain the technical and managerial significance of DE using examples

The Attitude levels toward introduction of DE technologies are described as follows:

1. DE technologies don't concern me
2. I feel the necessity of DE technologies
3. I want to introduce DE technologies
4. I have introduced DE technologies
5. I make full use of DE technologies

Fig. 4 shows the changes in knowledge and attitude regarding DE evaluated by the students. This result shows that the DE education in YUMOT is effective for managers, technicians, and engineers who participate in the program.

Of course, the teaching and evaluation methods will be improved as DE education projects in YUMOT go on.

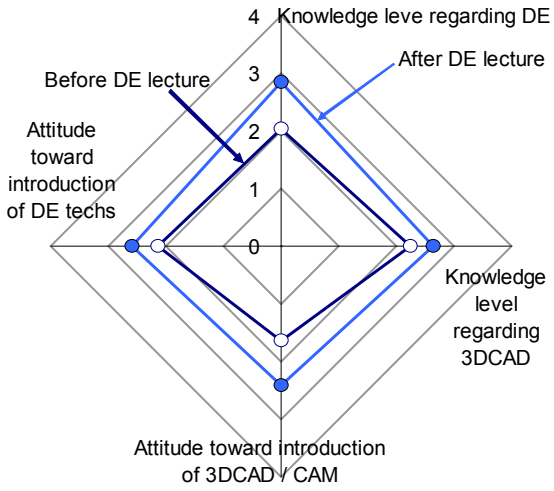


Fig. 4 Evaluation of DE education

Conclusion

In this manuscript, the necessity of human resource cultivation and innovation in regions was explained according to the policies of the Japanese government. The DE education projects were shown as examples of Yamaguchi University's activities toward the advanced human resources cultivation. To make manufacturers learn the underlying thought of DE from the leading job sites, YUMOT used the remote lecture system. Results of evaluation showed that this system was effective for manufacturers. The achievement of the project will be reflected to the successive DE education projects.

Perspective about MOT Education Based on Chinese Case Study

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Contents

- Introduction
- Technological economy & management in China
- Master of engineering-project management in China
- TMBA in China
- MOT – an emerging education in China
- Perspectives to MOT education
- Conclusion

1 Introduction

The MOT education in China is just at its renascent stage.

MOT in China have three prototypes:
1) Major & research field: technological economy & management
2) Major: Master of Engineering-project management
3) Major: TMBA-Technology MBA

2 Technological economy & management in China

Technological economy & management as a Master's degree program and a research field started in 1984.

Up to now, the most famous universities in this field are: Tsinghua University ,Zhejiang University, Wuhan University, Jilin University, and Wuhan University of Technology.

Technological economy & management is a sub-discipline of business administration under the China Subjects Catalogue.

Definition: 華南理工大學 South China University of Technology

The technological economy & management aims to cultivate the first-class professional personnel who have solid economics and management knowledge, the theories and methods of technology economics, project management, and technological innovation etc., and have the ability to accomplish project management, venture capital analysis, corporate technological innovation.

The orientations under the major technological economy & management

Wuhan University:

1) Corporate technological management
2) Technology entrepreneurship
3) Venture capital management

The orientations under the major technological economy & management

北京化工大学
Beijing University of Chemical Technology

Beijing University of Chemical Technology:

1) Assessment and management of technology and economy project
2) MOT
3) Technological innovation management
4) Technological progress and sustainable development

The orientations under the major technological economy & management

大连理工大学 Dalian University Of Technology

Dalian University of Technology:

1) MOT
2) High-tech industry development
3) Industrial innovation
4) Assessment and analysis of technological economy
5) Regional economic development

The curriculum of the major technological economy & management

中国人民大学商学院 School of Business Renmin University of China

Renmin University of China:

Economics; Marketing; Managerial Accounting ; Corporate Financial Management; Organizational Behavior; Technological Economics; Technological Innovation Economics; R&D Management; MIS; English for Management.

The curriculum of the major technological economy & management

Shandong Economic University:

Managerial Economics; Quantitative Analysis for management; Technological Economics; Value Engineering; Project Management; Technological Innovation; Management Software; Applied Statistics

The curriculum of the major technological economy & management

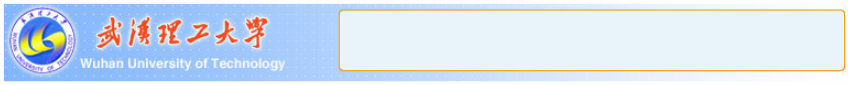
South China University of Technology:

Management; Economics; Research Methodology; Technological Innovation; Entrepreneurship; Technological Economics; Project Management; Venture Capital; Risk Management; Systems Engineering; Data, Modeling & Decision-making

3 Master of Engineering-project management in China

The main branches and research fields of Master of Engineering are engineering subjects such as mechanics, electronics, and etc. Project Management is a subsidiary branch or research field in Master of Engineering .

In this major, universities recruit part time students with engineering and technology background, to cultivate engineering & technology management personnel.



4 TMBA in China

TMBA- Technology MBA

Or Techno-MBA

Mistaking : Tourism MBA

TMBA joint-venture case in China

1) Tsinghua University & The University of Arizona

TMBA project started at Sept. 2003

Jointly Cultivate Management of Technology personnel for Motorola China

Core courses in Tsinghua – Arizona TMBA

Management Decision-Making

Management Skill

Human Resource Management in High-Tech Company

Operational Management in High-Tech Company

Products Management

Strategic Management

SDUST 山东科技大学

TMBA joint-venture case in China

2) Shandong University of Science and Technology & Woosuk University

TMBA project started at Sept. 2006

Jointly Cultivate Management of Technology personnel for Chinese companies with 1+1.5 mode .

TMBA typical case in China: University of Electronics and Technology of China

TMBA for IT Management

Core Courses: Organizational Behavior; Economics; Accounting; Finance ;Marketing; Statistics; Decision Analysis; Computer Methods; E-commerce; Network Marketing; Supply Chain Management under network environment; Management of Emerging Technology; Management of High-Tech Company.

5 MOT-An emerging education in China

Textbook series published in China, Tsinghua University Press(2004)

Methodology of Technological Innovation Management

Corporate Information Strategic Management

Technology Transfer and Technology Transaction

Methods of Idea Development

Knowledge Management

Technology Development

The 4th China MOT Forum

April 29 Chengdu

Main topics:

Management of Complicated Technology

Management of Emerging Technology

Management of Breakthrough Technological Innovation

R&D Management

New Product Development

Project Management

Knowledge Management

北京大学 软件与微电子学院
School of Software and Microelectronics, Peking University

MOT Department, School of Software and Micro-electronics , Peking University

To cultivate IT entrepreneurship personnel, IT project management personnel, IT technology based marketing personnel.

IT management

e-management

中国科学技术大学
University of Science and Technology of China

MOT training program (non-diploma education) by University of Science and Technology of China

Core courses:

Management of Technological Management; Management; Team work and management skill; Knowledge Management; Marketing; Economics; Scientific & Technological Policy; Entrepreneurship Management

5 Perspectives to MOT education

The Four Stages of MOT Development

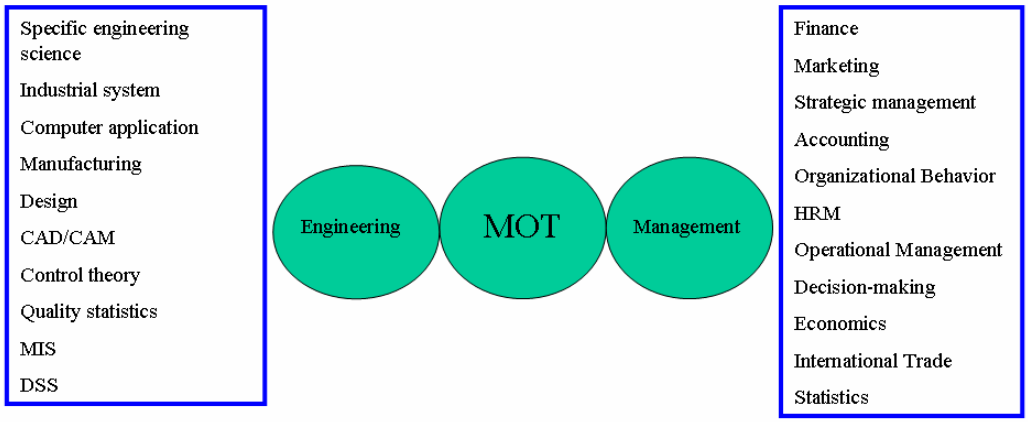
Stage one: R&D Management

Stage two: Management of technological innovation

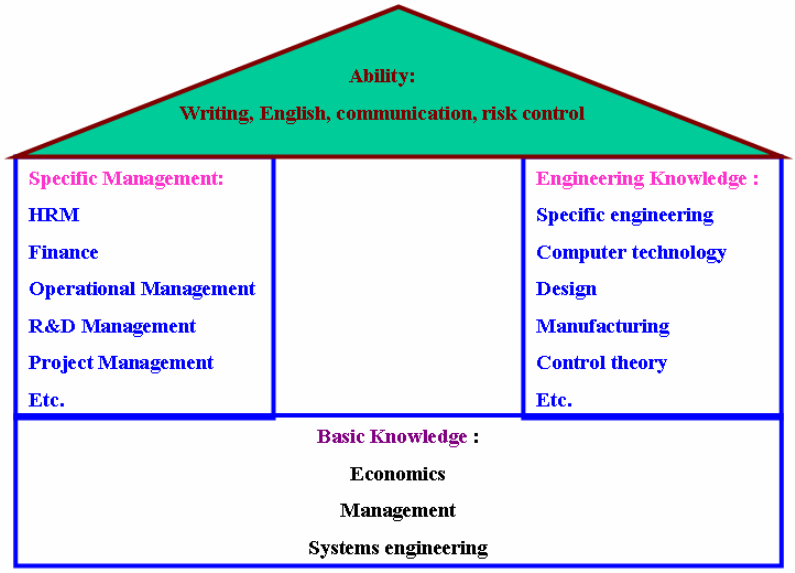
Stage three: Technology planning

Stage four: Strategic MOT

MOT related subjects (Wu Guisheng ,Xie Wei ,2004)



Knowledge-Ability-House structure of MOT personnel



Suggestions for MOT education

1) Curriculum- Technology + Management

Technology × Management (OK)

2) Students – Management background

Technology background (Ok)

3) Supervisors –Single-supervisor

Duo-supervisor (Ok)

Suggested Courses (Economics and Management):

Economics

Management

Systems Engineering

Applied Statistics

Management Writing

Organizational Behavior

Human Resource Management

Strategic Management

Marketing

Corporate Finance

R&D Risk Management

Management of Technological Innovation

Technological forecasting and Planning

Creative Techniques

R&D Project Management

E-Commerce & Supply Chain Management

Management of Advanced Manufacturing

Importance of Open Innovation and Alliance Strategy - the Second State of Alliance Management Study 2007

Geert Duysters
United Nations University, Maastricht Economic Research Institute on Innovation and Technology (UNU-MERIT)
(E-mail: G.M.Duysters@tm.tue.nl)

Abstract

This presentation describes the results of the Second State of Alliance Management research project, carried out on behalf of the Association of Strategic Alliance Professionals and sponsored by Cisco Systems. Approximately 200 companies responded to our request to answer 60 questions related to their alliances and alliance management.

The key findings of the report are:

- alliance management continues to be a dynamic and rapidly developing profession;
- average success rates of alliances are 49.5%;
- best practice alliance management raises the alliance success rates substantially;
- companies that do not use best practices will rarely have success rates above 20%; whereas companies that implement a few best practices can easily raise their success rates to almost 50%;
- top alliance performers with success rates over 60% tend to focus on measuring and evaluating alliances, as well as on alliance management development;
- the implementation of alliance management best practices has significantly increased since the First State of Alliance Management research project that was carried out five years ago;
- five years ago, European companies lagged far behind American companies with respect to their application of best practices; now, European countries have completely closed this gap.
- alliance evaluation tools turn out to be the most important tools for increasing alliance success.

E-Communication Technologies in Project-Based and Traditional Organizations

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Abstract

Electronic communication (e-communication) is a system used as means of sending or retrieving messages through computer or Internet connections. Today this includes a multitude of communication tools, ranging from simple forms such as e-mails to more complex forms, e.g. electronic document management systems, SAP and project planning systems. The introduction of different e-communication tools may alter the firm operations, providing firms with innovate venues to impacting their management processes. The purpose of this article is to examine how the introduction of electronic communication in the Architectural-Engineering-Construction (AEC) industry is impacting on two domains of management, namely production management and project management. By looking at the impact, we want to pinpoint which e-communication tools are more tightly coupled with improved performance in either domains of management and how can firms actually benefit the most from these tools. Is a project or a production environment in more need of a certain tool?

The distinction between production management and project management is that production management is the job of coordinating and controlling all the activities required to make a product, whereas the project management is concerned with the overall planning and co-ordination of a project from inception to completion aimed at meeting the client's requirements and ensuring completion on time, within cost and to required quality standards. E-communication can be divided into intra-organizational and inter-organizational contexts with their own challenges and opportunities. Depending on form and types of the complexity of their interaction, the project-based organizations and traditional organizations face different communications needs and barriers that require different applications of e-communication.

Key words: e-communication, project business, intra-organizations, inter-organization

1 Introduction

Project business denotes the overall hundreds, indeed thousands tasks of a project

company that creates and delivers projects to its customers. The supplier, for its part, takes more responsibility for the success of a project than it would if supplying only some components or parts, mainly in the form of export. Project business is thus an interaction of inter-organizational and intra-organizational activities and their structures with respect to marketing, procuring, and executing project activities. Davies and Hobday [1] use the term project business to refer to "organizations – which may be entire firms or units within firms – that deploy projects to achieve major business objectives, including all firms which design and produce complex products and systems (CoPS)".

For the purpose of this study, project business is defined broadly to encompass all business functions in which network actors and other stakeholders are involved in the process. These functions can be described along the life cycle of a project as: 'management', 'customer interface' (or 'concept development'), 'engineering', 'supply and procurement', 'transportation and logistics', 'construction', and 'operation'. In all of these activities, intra-organizational processes interact with inter-organizational processes throughout the project life cycle and, hence, communication plays a vital role in organizations.

Past research on improving communication focused on internal organizational communication, and most of this attention has been on the availability of communication for intra-organizational communication of traditional business organizations (TBO) [2, 3, 4, 5, 6, 7, 8, 9, 10, 11, and 12]. However, the distinctive characteristics (uniqueness, uncertainty and complexity) of project business with its distinctive communication needs mean that any attempt to improve communication on the basis of traditional organizations is unlikely to fulfill the special requirements of project business. In particular, a focus on the company's internal communication fails to recognize the importance of communication with external networks, partners, and other stakeholder, in the conduct of project business. Indeed, researchers in the area of project management have largely neglected such inter-organizational communication that can be supported by adoption of available technologies.

Very little attention has been paid to the integration of inter-organizational and intra-organizational perspectives in project-based organizations. Although, there has been industry-driven research done in this area in Finland, mostly on a technical level of producing applications and agreeing on standards, e.g. the VERA-program 1997-2002 [13] and the KITARA-program started in 2005 [14]. In particular, no data can be found in the context of e-communication availability and its actual usages in engineering, procurement, and construction (EPC) projects. This represents a significant gap in the literature—because project-based organizations (PBOs) must be able to conduct efficient business operations by utilizing new technology.

Therefore, the driving force for this study is the gap between the firms engaged in

e-communication covering project-based organization and e-communication supporting traditional organization, and the reality they face.

The effort is to elaborate some thoughts and views on e-communication which interrelate the firms' inter- and intra-organizational communication usage. In line with the integrated communication and available technologies, we discuss its usages in PBO. Therefore our main research question is:

How are e-communication needs fulfilled by the available technologies in project-based organizations?

The first step in addressing the above question is to establish the difference between PBO and 'traditional' businesses organizations (TBO). The organizations that are involved in project business are always formed around the tasks involved with its stakeholders. Therefore, it is appropriate to establish a framework for the intra- and inter-communication applying the emerging technologies. Establishing such a framework will allow us a better understanding of how firms communicate with their internal and external partners when doing project business.

The rest of this paper is arranged as follows. The next section 2 reviews the literature and pin downs the differences between traditional and project-based organizations. It also elucidates communication style between such organizations with inter- and intra-organizational perspectives. Section 3 describes communication needs of traditional as well as project-based organizations. Section 4 discusses the emerging technologies and their actual usage in PBO. Finally, the conclusions and offers suggestions for future work in Section 5.

2. Project-Based and Traditional Organizations

The major characteristics of project business are: (i) uniqueness; (ii) complexity; and (iii) discontinuity. A project is unique in the sense that every project differs from another in size, type, customers, suppliers, volume, price, and so on. It is complex in terms of the technical, financial, political, and social factors involved. Finally, it is discontinuous in terms of a high degree of discontinuity in economic relations between suppliers and the customers.

The nature of project business means that organizations involved in project management must be specialized in communication if they are to offer a full range of services to their customers, cope with demand fluctuations, and shorten response times. Past research [15] has emphasis on the importance of communication and improving communication processes focusing on internal organizational capabilities, and most of this attention has been on the communication and process development [2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12].

Most recent contributions on project approach are pointing out that project approach is becoming more popular day-by-day in the modern economy. It has emerged as a specialized area of management to meet the needs of organization as to accomplish specific objectives and goals. Today project management approach is characterized by newly developed methods and techniques that are

continually advancing and evolving as a result of ongoing research and practice. There are a few reasons for this development. First of all, today business environment is turbulent and rapid changes in external environment require immediate response and traditional techniques of handling the project are not appropriate in this regard. Secondly, growing organizations have variety of problems and putting those problems in project framework is very effective and efficient.

In spite of increasing practice of project approach, the project managers are still confused because of two reasons. First of all, the goals of the project are likely to change and become more demanding under the changing external circumstances which are beyond the company control. Secondly, the traditional techniques of handling the project are not always properly fitting in more recent times. The reason for this is in the fact that the organizations are also growing along with the external environment.

It is clear that project management will be of critical importance in future because of dynamics external circumstances. These changing external dynamics are putting new development trends in organizations. So in order to understand about the project development approach, it is better to study it under the perspective of organizational development.

Table 1: Characteristics of Project-based Organizations and Traditional Business Organizations

Project-based Organizations	**Traditional Business Organizations**
• ***Temporary Arrangement***	• ***Continuous Operations***
• ***Emphasis on goals***	• ***Emphasis on working*** **processes**
• ***Dynamic***	• ***Stable***
• ***Flexible***	• ***Inflexible***
• ***Non-hierarchic organization***	• ***Hierarchic organization***
• ***Decentralized decision making***	• ***Centralized decision making***

Project organizations and the established methods and tools of project management require further interest and investigation. Inside the routine organization, there are constant and well known institutions like functional groups, departments, plants, branches where knowledge and experiences are acquired, stored, and dispersed. Hence, these institutions can be asked and their knowledge and experiences can be recovered, despite the specific appearance of the collections, e.g. in documentation, records, competent employee or hidden within the working process.

In general, these solutions are not accessible for the knowledge and experiences, which were obtained and collected during projects. Projects are as distinct as temporary organizations with particular objectives, detailed tasks, and restricted time and budget. When a project is finished, normally there is no institution or body left where existing knowledge can be accessed. Meeting

spots, like groups, departments, plants, branches in the regular organizations, no longer exist after the ending of a project. In many cases, even the place where the records of a specific project are accumulated will be unidentified. After the ending, the organization of the project is broken up and no longer exists. As well, it will be hard to discover which employees worked on a recently finished project, who were accountable for specific tasks, and where these employees are working now within the company. These types of troubles will increase with the number of projects running in parallel, organized securing of knowledge and experiences is even more important in multi-project management. Companies not systematically securing knowledge gained in projects for later usage risk that some certain knowledge and useful experiences get vanished with the end of a project. Traditional project management concentrates on planning, organization, directing and controlling resources to achieve specific goals on time and within budget. Within traditional project management efficiency and effectiveness of the work of the project's team members is significant. The majority of companies are investing a lot in innovative project work but investing nothing in evaluating and learning from it. Companies learn the largest part within projects, but cannot communicate their experiences. At best, project team members keep the knowledge and experiences as individual knowledge, which they may use in the future.Apart from understanding the internal workings of the organization, it is important to identify the external issues involved in project management—to understand their links and to manage the interdependencies of actors, activities, and resources. The firm's internal and external actors drive the activities of the network and develop it in different directions—depending on the nature of the interdependencies that exist.

This study therefore presents a framework that is elaborated on the basis of the reciprocal interactions of activities within and outside the organization—thus providing a coherent basis for continuous business-process improvement. Therefore, the differences in characteristics and communication needs are great but still the similarities are even bigger, implying that technologies for supporting PBO and TBO are able to be cross-productive.

3. Intra-Organizational and Inter-Organizational Communications in PBO

Communication is most often described along three dimensions: content, form and direction. Content and form together make up the messages that are sent (directed) through a channel to its receiver. Any of three dimensions can get disturbed by 'noise' that distorts the message or direction of the message. There are many barriers that impede communication, ranging from language-barriers to lack of understanding of the context.

Adriaanse and Voordijk [16] state that the contract, the frames of reference of the parties involved and the interests of the parties involved (together with a lack of trust) are three major factors influencing inter-organizational communication (i.e., communication between client and contractor) in the construction phase of construction projects. Here we argue that in projects the initial phases

are extremely important as the needs of pre-contractual communication is crucial as well as the need for early risk analysis, implying that much communication takes place before an actual contract is drawn up. In the early phase of the project, the communication could be of many forms, communication can be verbal, written (e.g. textual, drawings, graphics) or non-verbal (e.g. gestures). The project-management literature has focused mainly on intra-organizational communication aspects [17, 18] —how a project is planned, controlled, and delivered. But communicating in a project is conceptually different from the traditional stable manufacturing organizations. Management of a project involves management of that project's uniqueness, complexities, and uncertainties, and this requires both an intra-organizational perspective and an inter-organizational perspective. The uniqueness, complexities, and uncertainties should be managed simultaneously. If the focus is on the communication in networks, rather than in the single firm, issues that arise both inside and outside organizations demand availability of appropriate communications tools. In accordance with this view, the study focuses on availability of tools for communication and their actual use in project-based organizations.

This attempts to develop a greater understanding of the contextual aspects of communication in an inter-organizational and intra-organizational context. Communication tools have been revolutionized with the explosion in information technology—as a multitude of methods and software programs have become available for business. Sophisticated software programmes are available and procured, many of which are left on the hard disk without any use from the senior managers that commissioned the software.

A project business involves intra-organizational and inter-organizational networks that require different types of knowledge and communication. One of the difficulties is that the available communication methods are not easy to use or deemed unnecessary in project-based organizations. A framework that combines intra-organizational networks with inter-organizational networks is required to communicate efficiently and effectively throughout the business operations. This will allow the project manager to focus on how to communicate in various situations in order to manage the project-based organizations. In this paper, potential differences between inter-organizational and intra-organizational communication in project business are investigated.

In project business, intra-organizations are not only involved in direct customer interface, but also in indirect support of the processes of a firm. A variety of intra-organizations can exist—for example, matrix organizations, projectized organizations, and coordinating organizations. Moreover, several structures of intra-organizations can exist to perform project activities. These arrangements depend on the proportion of the business involved in a project, the scope of the project, and the duration of the projects involved. All these issues are connected to the communication needs of the organization.

Within project management literature Thompson and Richardson [19] have argued that

organizational systems have become more open, complex, and political. This creates a greater level of uncertainty to the organizations and contributes to an unstable and changing project environment. Artto and Wickström [20] say that the project business must be managed by external factors such as characteristics of the product and the competitive environment. This high level of uncertainty challenges traditional approaches to process formulation and communication. Many projects that are incorrectly labeled as 'systems projects' fail because of the leadership's failure to recognize the relationship of the system within the whole organization [21]. Thus, the way of communication will have impact on these kinds of failures, as understanding how to remedy would point to new applications of the communication technologies.

Earlier research on intra-organizations has focused mainly on environments that could impede the development of corporations, rather than those from which benefits are derived [2, 3, 22, 23, 24, and 25]. However, most organizations are in an 'intermediate context' whereby processes can be developed and benefits can be mutually derived. The important organizational characteristics for successful project development include openness in communication, adequate environmental scanning, management support, and established organizational values. In addition, intra-organizational business processes have an important complementary function (along with inter-organizational processes) in fostering the planning and execution of a project. A growing body of evidence suggests that these intra-organizational and inter-organizational network relationships have a significant effect on organizational processes [26].

Developing communication methods with an inter-organizational and intra-organizational perspective requires a precise understanding of what kinds of communication practices foster business development. According to Amabile [27], managers often destroy creativity in project-business development by failing to make good connections between people and activities. It is therefore important to identify the interdependencies between actors and activities, and to identify the resources they require to perform their tasks. The communication needs are tightly coupled with characteristics of the actors, activities and resources. Thus, in order to provide sufficient support and facilitation of communication in project-based as well as traditional organizations the communication needs are to be investigated and developed.

4. Electronic Communication Technologies and their Usages

Traditional forms of communication in organizations is carried out through face-to-face interaction; paper-based drawings, letters and graphics; through telephone calls. E-communication is doing the same thing, but electronically. We have made the distinction that e-communication is defined as embracing all kinds of computer-mediated communication in which individuals exchange messages with others, either individually or in groups. E-communication is hence synonymous with computer-mediated communication. Another definition is that electronic communication

(e-communication) is a system used as means of sending or retrieving messages through computers or Internet connections. E-communication can take many forms, whether it is synchronous (real-time) or asynchronous; textual/verbal only or multimedia.

E-communication facilitates the information flows of the firm, within and across firm boundaries [28]. E-communication in an industry setting can roughly be divided into two groups: 1) intra-organizational communication and 2) inter-organizational communication (e.g. customer communication, supplier communication and partners, e.g. multiple organizations working together on a project). Each of these communication modes requires its own data sets, communication channels and tools to facilitate the communication. Using electronic-enabled communication, organizations today have added tremendous reach for their communication needs, whether the communication takes place between organizations (with customers, suppliers, partners) or inside their own organization.

The cost of communication has decreased compared to traditional means (e.g. distribution of paper copies vs. attaching a file to an e-mail), the speed of communication has increased rapidly (e.g. time for an electronic message to arrive compared to a snail mail delivery), and the technologies involved in bringing e-communications are becoming evermore versatile (e.g. both video-conferencing and textual communication simultaneously). There are still some disadvantages with e-communication, e.g. lacking interpersonal exchange and legal implications (e.g. validity of signed paper compared sent e-mail). These areas are remedied over time as technologies evolve and, e.g. digital signatures are standardized. Still, the study of adoption barriers is important for recognizing the reason for rejecting a technology, or in this case, the use of e-communication. The firm should take stock of the adoption barriers it is facing and how they can manage them, what can be done internally and what have to be placed in the hands of outside partners.

Classifications of adoption barriers can be made on both general e-business and application-specific levels. When considering adoption barriers for firms, it might be imperative to investigate whether the barriers are generic or time/firm-specific. Generic barriers do not change rapidly as they are inherent to the industry or the market. Firm-specific barriers are associated with the organizational schemas and the resource constraints affecting the decisions to be made. Time-specific barriers might become obsolete by e.g. the introduction of new infrastructure support technologies or requirements of less technical competence (internally) to the adopting firm. Depending on the type of barriers, the speed of adoption may be slow or even standing still, leading to patterns of early or late adoption.

Central to the problem discussion is that the barriers may be considered to occur on three different levels: 1) individual level (e.g. project team member, procurement manager), 2) firm level and 3) network level. The notion of different levels for adoption is nothing new as adoption decisions on different levels are dealt with in the innovation diffusion theory literature in the form of

optional, collective and authority adoption-decisions [29]. What is novel here is the view of the barriers (and benefits) residing on different levels, and that conflicts between levels create situations more complex and multifaceted than previously conceived. Adoption barriers on the firm level are mostly identified as resource issues, e.g. technological and monetary restrictions. The network level consists of connected firms co-operating on projects or in the form of supply-chains. Barriers that reside on the network level may consist of social norms, risks of non-established standards or legal issues. This is exemplified in figure 1.

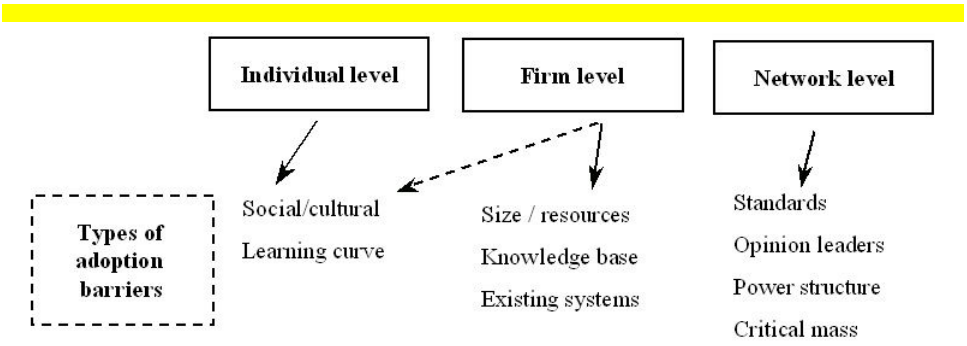

Figure 1 Links between levels and adoption barriers

Further, IT implementation barriers exist and can be identified and handled from different perspectives, e.g. the top-down effects on multi-level IT implementation barriers with links to implementation coping strategies [30]. On an industry level, industry nature in the form of competitiveness, cost sensitivity, resource limitations and fragmentation, may be barriers that inhibit IT implementation. On an organizational level, the lack of IT investment justifications and available resources may inhibit implementation, as well as problems with strategic foresight. On a project level, the nature of the projects themselves (uniqueness, complexity, and discontinuity) provides barriers for IT implementation. In a study of the Australian construction industry [30], the most significant barrier on project-level were tight project time-frames that inhibit training and experimenting with IT, followed by limitations in IT expenditures, lack of IT leadership and low levels of technological literacy.

The issue of evaluating IT costs when developing an IT infrastructure that can be economically justified are also a venue that needs more focus and development, especially regarding indirect human costs (e.g. management time on planning and integrating new system, internal system support) and indirect organizational costs (e.g. productivity losses, resistance to change) [31]. The concept of the IT lifecycle is providing firms with further complexity in the investment situation but also more realistic picture of what can be expected from the IT investment.

Communication processes (i.e. exchange of information) can either occur internally or externally to the firm. Intra-organizational e-communication is in its simplest mode mere electronic mails (or fax), while more enhanced e-communications over Intranet or local networks can be streamed either in different forms: text, audio and/or visual. An Intranet is a network based on Transfer Control Protocol/Internet Protocol (TCP/IP) protocols and available only to the members of the organization, as well as often protected by a firewall [32]. Inter-organizational e-communication can be focused on customers, suppliers, partners or other parties. The interface with external parties provides support for order-taking, procurement, collaboration or other processes. Applications exist for constructing and managing relationships these relations, in the forms of Extranets, EDI, e-commerce, electronic document systems (EDM) and so on.

The spread of e-communication varies across industries, networks and even organizations. The rate, extent and frequency of adoption of e-communication all quantify technology adoption according to the economic-rationalistic approach [33]. The critique against the so-called dominant paradigm of ICT innovation coupled with economic and rationalistic behavior is that the focus on quantity of adoption and the inherent beneficial perceptions of innovation may not paint a totally realistic picture. Adoption of transient technologies, prior adopters' affluence adoption and more is not always better are factors that contradict the quantity approach for IT adoption.

The adoption decisions may also be based on the dimensions of adoption initiative and innovation stimulus, making the adoption decision pro-active, reactive, forced or even arbitrary. Further, the choice of electronic business solutions is as well dependent on criteria like relative network power, integration level of solutions, product characteristics and supply chain relationships [34]. Researchers have recognized the concept of task-technology fit were performance impacts are the results of the fit between the features of the technology deployed and the requirements of the task [35]. One can expect that the better the information technology in consideration will fit the task for the potential adopter, the more willing will the potential adopter be to adopt the actual technology. The task-technology fit (TTF) theory holds that ICT is more likely to have a positive impact on individual performance if the capabilities of the ICT match the tasks that the user must perform. In project setting, performance of many individuals has to be taken into account, thereby posing conflicting views on the adoption of the communication technologies.

When the firm decides whether to adopt e-communication or not, the complexity in the decision should be apparent. The decision is not only based on internal perceptions but also the business milieu that the firms reside in. The determinants of e-communication adoption can be divided in several different typologies: incremental vs. revolutionary, internal vs. external stimuli, key drivers (technological, economic, social, organizational drivers and barriers). In Wu and Lee's study [28] on e-communication in four different industries, they recognized two sets of factors that

effect adoption of e-communication: 1) internal push factors, and 2) external pull factors. Both sets of factors are influenced by the environmental turbulence, whether it is changes in technological or market turbulence. Internal push factors consist of customer orientation and competitor orientation. These two factors support understanding of the value creation of target customer and how the firm stands relative to its competitors. External pull factors consist of customer pressure and normative pressure. Customer pressure is the power that customer exert on the firms, forcing these to adopt certain technologies. Normative pressure stems from the need of the firm to have the same technology as the rest of industry, without thorough examination of the potential of the adopted technology. In communicating on a project, the mode and tool for communication may be set from the onset. E.g. in big construction projects, the use or non-use of electronic document management system can be afflicted by the head contractor, and if used the systems may vary according to what collaborators the organization communicate with.

To analyze what e-communication solution is or could be adopted by the organisation, we have first to understand the network structure the company is part of and maybe consider where in the network the organization want to position itself. The locus of control among partiers in the network affects the choice of solution, implying that a hierarchical network structure indicate a narrow locus of control and less need of completely open solutions [36]. For example, in a network situation where the relative power of one or a few participants is very high, one could expect partner-specific solutions, as the larger organization(s) may dominate their smaller partners and can therefore enforce solutions more suitable or compatible with their existing internal systems [37]In a network with more evenly distributed power structure, no single participants can be expected to enforce their specific solutions, as this could limit options to connect to potential partners.

As pointed out earlier, the ability of the e-communication solution to integrate to existing systems in the organization is of utmost importance. Therefore, an investment in an e-communication solution might require further development or even re-invention of the business information systems that is the backbone of the firm.

5. Conclusions

The main point of this paper is that different organizational forms required different approaches for applying communication tools. We have elaborated on the main differences between project-based organizations and traditional organizations, e.g. varying time-frame, complexity of collaboration, and knowledge re-applicability. PBOs are more complex than traditional organizations in respect to number of partners, activities and, hence require more emphasis on how to support and simplify the communication.

As the project-based organizations conduct several projects with multiple partners, the inter-organizational communication requirements are higher than traditional organizations where

inter-organizational communication is carried out vertically.

E-communication has different sets of application and tools. Applications that are more interesting are those where the required resources are reasonable and the exhibited barriers can be overcome without too great an effort. Also the over-belief in quantifiable measures of IT adoption has to be taken into account. In order to successfully apply e-communication tools, the organization has to look to the available tools and find the one that fill its communication need.

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