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# e-Supply Chain for International Technology Package Development

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Traditional technology transfer supply chain frequently fails to meet the technology recipients' requirements since the functions of a traditional supply chain are executed independently. Furthermore the technology suppliers are in need of improving their supply chain in order to survive in an increasingly competitive environment. The recent advancement of Internet technology and information and communication technologies (ICTs) may help in resolving some of the difficulties associated with conventional supply chain. Due to the aforementioned factors, this research has been undertaken and executed through theoretical and a multiple case study method. A framework of e-supply chain (E-supply chain for technology transfer refers to the IT-supported entire process that connects the technology supplier, partners, subcontractors and technology recipient in the form of an extended enterprise to develop the technology package and delivers it to the technology recipient) for technology transfer has been developed through a comparative case analysis of the five investigated companies.

The technology suppliers have utilized the new capabilities of ICTs and redesigned the supply chain process. They have executed the supply chain as a process, instead of separate independent functions.

This research (a review of current literature and empirical research) suggests that in order to make the e-supply chain for technology transfer of a western country company (i.e., technology supplier) more efficient and effective than the conventional technology development and delivery approach, it should be considered as a process whose phases include: planning, implementation and evaluation (see Table I). This paper focuses only on the e-supply chain for technology package development for international technology transfer, does not deal with all the aspects of IT-supported technology transfer process. Training issues related to the adoption of technology packages are beyond the scope of this research, our other research studies have covered them. Our other research studies also discuss technology recipient's absorptive capacity and complex technology transfer.

TABLE I  
A FRAMEWORK OF THE E-SUPPLY CHAIN FOR TECHNOLOGY PACKAGE DEVELOPMENT FOR INTERNATIONAL TECHNOLOGY TRANSFER

<i>Phases and key tasks</i>	<i>ICT tools used</i>	<i>Major benefits obtained</i>
<p><i>1. Planning</i></p> <p>Collecting information from the technology recipient about the technological needs, analysing this information, determining the components of the technology package, and making agreement about this technology package with the recipient.</p> <p>Deciding which parts of the technology package will be made by the company and which parts will be developed by the subcontractors.</p>	<ul style="list-style-type: none"> <li>• Internal databases</li> <li>• E-mail</li> <li>• Web</li> <li>• Intranet</li> <li>• Extranet</li> <li>• Groupware</li> <li>• ERP resources</li> <li>• Traditional methods (face-to-face meetings and interviews).</li> </ul>	<ul style="list-style-type: none"> <li>• Faster collection of information</li> <li>• Quick identification of the technological needs of the technology recipient</li> <li>• Effective communications among employees around the world</li> <li>• Rapid identification of suitable technology.</li> </ul>
<p><i>2. Implementation</i></p> <p>The technology supplier sends purchase orders to the subcontractors, delivers the specific product specifications and makes a contract. Information flows between the supplier and the subcontractors in both directions.</p> <p>The supplier stores the technology package development related information in Intranet and Extranet and develops parts of the technology package.</p>	<ul style="list-style-type: none"> <li>• Intranet</li> <li>• Extranet</li> <li>• Internet</li> <li>• Web based project management software.</li> </ul>	<ul style="list-style-type: none"> <li>• Improved coordination of the activities of the technology package development and delivery</li> <li>• Improved communications among all the partners</li> <li>• Worldwide collaboration</li> <li>• Delivery of a high quality technology package that fulfils the requirements of the technology recipient</li> </ul>

TABLE I  
A FRAMEWORK OF THE E-SUPPLY CHAIN FOR TECHNOLOGY PACKAGE DEVELOPMENT FOR INTERNATIONAL TECHNOLOGY TRANSFER (CONTINUES)

<i>Phases and key tasks</i>	<i>ICT tools used</i>	<i>Major benefits obtained</i>
<p>The subcontractors visit Extranet of the technology supplier to retrieve information, produce parts of the technology package, deliver them to the technology suppliers, and receive the payments.</p> <p>The technology recipient visits Extranet to check about the progress of the work. If the requirements for the technology package need to be changed, the recipient may also use Extranet to negotiate about the changes with the technology supplier.</p> <p>The technology supplier finalises the technology package incorporating the parts that were manufactured by the subcontractors, delivers them to the recipient along with the documentation, and receives the payment from the recipient.</p>		<ul style="list-style-type: none"> <li>• Developing a good relation with the technology recipient through satisfying its requirements</li> <li>• Faster delivery of the technology package</li> <li>• Lowered costs in delivering the technology package.</li> </ul>
<p><i>3. Evaluation</i></p> <p>Performance of the supply chain is measured against the expected results. Decision making processes concerning the future technology package development and delivery efforts rely on these performance evaluations.</p>	<ul style="list-style-type: none"> <li>• Intranet</li> <li>• Extranet</li> <li>• Database</li> <li>• E-mail</li> <li>• Web</li> <li>• Lotus Notes based system</li> <li>• Traditional methods (face-to-face meetings).</li> </ul>	<ul style="list-style-type: none"> <li>• Increases the capacity of monitoring the results</li> <li>• Fosters collaboration between experts around the world</li> <li>• Increases the capacity of reporting about the outcomes and problems</li> <li>• Rapid feedback system.</li> </ul>

The capabilities of new ICTs are increasing rapidly. Therefore, more powerful technologies (such as XML, Extensible Markup Language) should be utilized in the future to improve the e-supply chain performance. XML allows the sending and automated processing of business documents

such as purchase orders, invoices, and shipping notices over the Internet.

E-supply chain approach faces various problems including security and privacy problems. Further research is necessary to reveal how these problems of e-supply chains could be avoided and the maximum benefits achieved.