

Designing a lessons learned model to improve the success of new product development in project oriented organizations

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ABSTRACT

Nowadays, project-based organizations need to utilize intellectual capital and knowledge to become leader in their business activities. The new approach to use knowledge based skills from one side and development of the new complicated products from the other side have increased the need for designing a lessons learned model. The purpose of this paper is to design a lessons learned model to improve the success of new product development for project oriented organizations. The study designs a questionnaire in Likert scale and distributes it among 56 experts who were well informed about various techniques of new product development and lessons learned. Cronbach alphas for all components of the survey were well above the desirable level. The results of the survey have indicated that there were positive and meaningful relationships between lessons learned components and the success of the new product development.

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1. Introduction

Professionals and executives in any organization preserve precious assets with valuable experiences and knowledge (Goffin & Koners, 2011; Holzmann, 2013). When an expert is retired, a significant amount of experiences may be lost within organization and gaining such experience increase the costs of organizations, significantly (Milton, 2005, 2010). Recording knowledge and experiences create organizational memory and contributes to intellectual assets (Lantada et al., 2013). In other words, many engineers and managers normally express the desire to learn from the past project experience and they normally do not learn effectively from their present projects. The failure to learn valid and valuable lessons from project experiences can be contributed to a number of cognitive and social issues (Duhon & Elias, 2008). According to Duffield and Whitty (2012), a substantial challenge for government and business project organizations is to make sure that lessons are learned and the mistakes of the past would not be repeated. The explicit management of project experience through lessons learned on project planning and execution has become of strategic importance for several firms (Tautz et al., 2010). Vandeville and Shaikh (1999) described a structured method for gathering “lessons learned”

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information obtained from system development projects. Weber et al. (2001) surveyed lessons learned processes and systems, detailed their capabilities and limitations, examined lessons learned system design issues, and determined how artificial intelligence technologies could add to knowledge management solutions for these systems. According to Williams (2007, 2008, 2009), a key for successful project management is the capability to glean key learning's from the experience throughout the lifecycle of the project but the lessons learned from a special project would rarely incorporated into a firm's overall policies and procedures. Without a focused effort to gain on specific project learning's, lessons may be lost, mistakes could be repeated and opportunities for operational efficiency could be missed. During the past few years, there have been tremendous studies on lessons' learned and Table 1 describes different attributes discussed.

Table 1

The summary of the studies associated with lessons' learned and attributes

Attribute	Source
Being leader	Mihm, 2012; Garside, 1999; Kessler & Chakrabarti, 1996; Hobday, 2000; Williams, 1999, 2007, 2008; Ohno, 1988; Weber et al., 2000, 2001; Murmann, 1994
Communication, Environmental factors	Mihm, 2012; Hobday, 2000; Cooper & Kleinschmidt, 1993; Cooper, 1994; Cooper et al., 2004; Kessler & Chakrabarti, 1996; Milton, 2005; 2010
Optimization of repeated operations; Inside organization solutions; Determine the size and complexity of the project cycle time and project failure	Clark, 1989; Clark & Fujimoto, 1991; Levinthal, 1997; Love et al., 2005; Kung, 2013; Lake, 1991; Lynn et al., 1999; Nonaka et al., 1994; O'Reilly & Tushman, 2013
Department; Activity; Decision making	Saren, 1984; Hobday, 2000; Milton, 2005, 2010; Cooper & Kleinschmidt, 1993; Parry et al., 2008; Parry et al., 2008; Haque & Moore, 2004; Ohno, 1988; Kotnour, 2000; Dawes, 2009; DeFillippi & Arthur, 1998; Cooper et al., 2004
Validation; Implementation; production support	Duhon & Elias, 2008; DeFillippi & Arthur, 1998; Haque & James-Moore, 2004, 2005; Milton, 2005, 2010; Parry et al., 2008; Clark, 1989; Clark & Fujimoto, 1991
Concurrent engineering	Smith & Eppinger, 1997; Grabher, 2002; Ahmadi & Wang, 1999; Ha & Porteus, 1995
Cost reduction	Kessler & Chakrabarti, 1996; Von Zedtwitz, 2002; Ohno, 1988; Williams, 1999, 2007, 2008; DeFillippi & Arthur, 1998; Roemer et al., 2008; Dröge et al., 2000
Organizational capacity	Williams, 2007; Weber et al., 2001; Haque & James-Moore, 2004; Haque & Moore, 2005; Haque & Moore, 2004; Khuri et al., 1993; Cooper et al., 2004
Product innovation; having suitable production schedule; top management cooperation; limited innovation; project leadership; survey on competitors; teamwork selection; outsourcing	Khuri et al., 1993; Cooper et al., 2004; Love et al., 2005; Clark & Fujimoto, 1991; Lindner & Wald, 2011; Von Zedtwitz, 2002; Disterer, 2002; Biggs & Justice, 2011; Johnson et al., 2000; Julian, 2008; Nemoto et al., 2015; O'Dell & Hubert, 2011; Roemer et al., 2000
Decision support system	DeFillippi & Arthur, 1998; Grabher, 2002; Murmann, 1994
Industry type; production development; network marketing	Eisenhardt & Tabrizi, 1995; Khuri et al., 1993; Lindner & Wald, 2011
New product development; risk taking	Milton, 2005, 2010; Balachandra & Friar, 1997; Kong et al., 2015; Abrantes & Figueiredo, 2015; Darejeh & Singh, 2014; Everaert & Swenson, 2014
Agile production planning	Weber et al., 2000; Milton, 2010; Hanafy & ElMaraghy, 2015
Team learning	Kong et al., 2015; Flora et al., 2014; O'Leary & Selfridge, 2000
Recording experiences; publishing achievements; Knowledge sharing	Rajagopalan, 2014; Ren et al., 2003; Saren, 1984
Collecting common mistakes; Checklist; emphasis on successes, Integration, feedback usage	Flora et al., 2014; Simon, 1991

2. The proposed study

The purpose of this paper is to design a lessons learned model to improve the success of new product development for project oriented organizations. The study designs a questionnaire in Likert scale and distributes it among 56 experts who were well informed about various techniques of new product development and lessons learned. Cronbach alphas for all components of the survey were well above the desirable level. Based on the survey accomplished, we develop a conceptual model for the proposed study of this paper as shown in Fig. 1 as follows

Capability	Learning
	Skills
	Experience
Objectives	Common strategies
	Common goals
Customer orientation	Organizational identity
	Network marketing
	Trust
	Loyalty
	Customer requests
Organization	Networking
	Team working
	Participation
	Planning
Process	Continuous improvement
	Change management
	Reengineering
Intellectual property	Copyright
	Patent registration
System	Management system
	Financial system
	Knowledge management
	Professor of discipleship
Culture	Culture
	Delegation of authority
Organizational structure	Instruction
	Integration
	Knowledge structure
Organizational capacity	Environment
	Analyzing organization
	Market development
Knowledge	Awareness
	Individual creativity
	Organizational creativity
Trust	Motivation
	Job satisfaction
	Commitment
	Risk taking

Fig. 1. The conceptual model

We have performed an in-depth interview with some experts to learn more about the effects of different factors influencing on the success of new product development. In addition, we have coded every item obtained from the questionnaire in three digits. The first part of the code starts with a letter P, which represents the key point. The second part of the code refers to different interviews on various case studies and the last part states the key number in the questionnaire. For instance, PB8 represents the eighth key point from the interview on case study B. We have performed 14 interviews with experts and extracted 6 key points from the second interview, 5 key points from the third interview, 8 key points from the fourth interview, 9 key points from the fifth interview, 11 points from the sixth interview, 12 points from the seventh interview and 4 points from the eighth interview. Table 2 demonstrates the open cases, which have become clear on case study A.

Table 2

The key open issues for case study A

Index	Description	Open code
PA _{x1}	Paying attention to intelligence equipment helps us depend on strong research and development to advance the success.	Knowledge based system
PA _{x2}	Paying attention to the fact that our new achievement has come from our past experiences.	Experience
PA _{x3}	Normally, there must be a strong believe to trust to highly educated people.	Commitment
PA _{x4}	New product development has to be involved with all departments.	Creativity and innovation
PA _{x5}	Taking care of human resources is the most important efforts in any organization.	Satisfaction
PA _{x6}		Motivation

After having extensive interview with different experts, we have prepared a questionnaire in Likert scale and distributed among 56 experts. Cronbach alpha was within desirable level. In addition, Kolmogorov Smirnov test has indicated that the distribution of the data was normally distributed. Next, we present details of our findings.

3. The results

In this section, we present the results of the effects of different factors associated with lessons' learned on new product development. Table 3 presents the results of t-student test.

Table 3

The results of t-student test on relationship between lessons' learned and new product development

	Test Value = 3					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
New product development	37.658	55	.000	1.56604	1.4827	1.6494
Lessons' learned	34.351	55	.000	1.55198	1.4614	1.6425
Relationship	36.215	54	.000	1.50639	1.4230	1.5898

As we can observe from the results of Table 3, the relationship between new product development and lessons' learned are statistically significant. Table 4 shows the results of t-student values for different components of new product development. Again, all statistics are within desirable levels. Table 5 shows the results of t-student values on examining the sub-components of the lessons' learned. Finally, Table 6 shows the results of the implementation of lessons' learned on new product development and as we can observe there were positive and meaningful relationships between different factors associated with lessons' learned and new product development.

Table 4

The result of t-student on validating new product development

	Test Value = 3					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Competence and capability	32.608	55	.000	1.60119	1.5028	1.6996
Attitude	30.413	55	.000	1.56122	1.4583	1.6641
Knowledge	22.837	55	.000	1.53571	1.4009	1.6705
Teaching and learning	23.550	55	.000	1.57143	1.4377	1.7052
Skills	24.405	55	.000	1.60714	1.4752	1.7391
Experience	20.273	55	.000	1.60714	1.4483	1.7660
Motivation	18.715	55	.000	1.57143	1.4032	1.7397
Job satisfaction	24.893	55	.000	1.62500	1.4942	1.7558
Commitment	24.893	55	.000	1.62500	1.4942	1.7558
Ethics	18.200	55	.000	1.53571	1.3666	1.7048
Risk taking	15.959	55	.000	1.46429	1.2804	1.6482
Forecasting	24.405	55	.000	1.60714	1.4752	1.7391
Awareness	17.354	55	.000	1.46429	1.2952	1.6334
Creativity and innovation	21.998	55	.000	1.48214	1.3471	1.6172
Environment	23.550	55	.000	1.57143	1.4377	1.7052
System analysis	24.405	55	.000	1.60714	1.4752	1.7391

Table 5
The results of testing the sub-factors influencing on lessons' learned

	Test Value = 3					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Norms, beliefs and values	16.727	55	.000	1.39286	1.2260	1.5597
Having solidarity and common vision and policies of the organization	15.060	55	.000	1.42857	1.2385	1.6187
The tolerability of staff	26.655	55	.000	1.67857	1.5524	1.8048
Working with contractors to create a common network products	16.526	55	.000	1.51786	1.3338	1.7019
Loyalty, commitment and integrity of the organization to customers	26.655	55	.000	1.67857	1.5524	1.8048
The centrality of ethics in the relationship between organizations and customers	24.405	55	.000	1.60714	1.4752	1.7391
Customer relationship network	24.405	55	.000	1.60714	1.4752	1.7391
Possession of a valid image (brand) among clients	24.405	55	.000	1.60714	1.4752	1.7391
Organization's structure and relationships between employees	15.959	55	.000	1.46429	1.2804	1.6482
the ability to perform activities in the form of teamwork	26.655	55	.000	1.67857	1.5524	1.8048
Organizations and associations active in the organization	19.642	55	.000	1.57143	1.4111	1.7318
Appropriate structure in the network	27.362	55	.000	1.69643	1.5722	1.8207
Network relationships among members	19.946	55	.000	1.58929	1.4296	1.7490
Succession planning system	16.526	55	.000	1.51786	1.3338	1.7019
Knowledge management and recording experiences	24.405	55	.000	1.60714	1.4752	1.7391
Financial system	26.655	55	.000	1.67857	1.5524	1.8048
Delegation of authority	15.060	55	.000	1.42857	1.2385	1.6187

Table 6
The results of the implementation of lessons' learned on new product development

	Test Value = 3					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Goals and organizational strategies	19.877	55	.000	1.56250	1.4050	1.7200
Organizing	23.085	55	.000	1.51786	1.3861	1.6496
Customer oriented	26.785	55	.000	1.54911	1.4332	1.6650
Vision and common policy	16.863	55	.000	1.23810	1.0910	1.3852
Common ideas	21.603	55	.000	1.46429	1.3284	1.6001
Common goals and precedents	24.405	54	.000	1.57273	1.4435	1.7019
Contractors Network	23.019	54	.000	1.44545	1.3196	1.5714
Tolerability	24.017	55	.000	1.45714	1.3356	1.5787
Customer intelligence and customer demands	27.667	55	.000	1.62500	1.5073	1.7427
Customer Relationship Network	21.397	55	.000	1.66071	1.5052	1.8163
Honesty and trust	19.092	55	.000	1.53571	1.3745	1.6969
Communication	23.177	55	.000	1.55357	1.4192	1.6879
Ethics	23.177	55	.000	1.55357	1.4192	1.6879
Organization identity	18.022	55	.000	1.44643	1.2856	1.6073
Networking	23.177	55	.000	1.55357	1.4192	1.6879
Team work	24.405	55	.000	1.60714	1.4752	1.7391
Type of organizing teams	23.177	55	.000	1.55357	1.4192	1.6879

4. Conclusion

In this paper, we have presented a comprehensive model to review the effects of different components of lessons learned on the success of new product development. The proposed study has gathered all the existing factors mentioned in the literature and using various comprehensive interviews with experts determined positive and meaningful relationships between lessons learned and new product development. The study has implemented for project-based organizations and has determined that intellectual properties were important components of such organizations. It also appears that the success of any new product development is highly influenced from the past experiences. Therefore, it is important to record all positive/negative experiences and use them for new tasks. In fact, by acquiring new capabilities and power of creativity and innovation, human capital, organizational advantages, project-based organizations can make changes.

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