African Journal of Business Management

Volume 8 Number 4 28 February, 2014

ISSN 1993-8233

Academic Journals

ABOUT AJBM

The **African Journal of Business Management (AJBM)** is published weekly (one volume per year) by Academic Journals.

African Journal of Business Management (AJBM) is an open access journal that publishes research analysis and inquiry into issues of importance to the business community. Articles in AJBM examine emerging trends and concerns in the areas of general management, business law, public responsibility and ethics, marketing theory and applications, business finance and investment, general business research, business and economics education, production/operations management, organizational behaviour and theory, strategic management policy, social issues and public policy, management organization, statistics and econometrics, personnel and industrial relations, technology and innovation, case studies, and management information systems. The goal of AJBM is to broaden the knowledge of business professionals and academicians by promoting free access and providing valuable insight to business-related information, research and ideas. AJBM is a weekly publication and all articles are peer-reviewed.

Contact Us

Editorial Office: ajbm@academicjournals.org

Help Desk: helpdesk@academicjournals.org

Website: http://www.academicjournals.org/journal/AJBM

Submit manuscript online http://ms.academicjournals.me/

African Journal of Business Management

Table of Contents: Volume 8 Number 4 28 February, 2014

ARTICLES

Review

Research Articles

academicJournals

Vol. 8(4), pp. 118-126, 28 February, 2014
DOI: 10.5897/AJBM2013.7285
ISSN 1993-8233

http://www.academicjournals.org/AJBM

African Journal of Business Management

Review

The effectiveness of knowledge sharing on projects: How companies prosper by what they know

Visvanathan Naicker* and Hishaam Benjamin

Graduate School of Business Leadership, University of South Africa, Cnr Janadel & Alexandra Avenues, Midrand 1685, P.O Box 392, UNISA, 0003, South Africa.

Received 17th November 2013; Accepted 4th February, 2014; Published 28th February 2014.

The topic focuses specifically on knowledge sharing on project team, specifically around project teams in the Information Systems (IS) sector. The paper review show knowledge sharing can be effective on IS projects, up to the point where the software is used by the business. A survey was conducted with participants who were actively involved in project teams. The focus was on key role-players, such as Project Managers, Business Analysts and Developers. The study established the knowledge sharing approaches on project teams and re-emphasised the importance of having a knowledge-sharing environment. Furthermore, the study proposed questions to understand the knowledge sharing approaches used on projects, how team members shared knowledge amongst each other, the systems they used to create a knowledge hub, the work environment which also including cultural aspects and also the types of rewards and recognitions that are in place at the workplaces. Despite the low volume of respondents some answers can be explored in further research, however serves as a platform for future studies to understand and assess knowledge sharing approaches.

Key words: Knowledge, Knowledge sharing (KS), Knowledge transfer (KT), Knowledge management (KM).

INTRODUCTION

Organisations have learnt the importance of knowledge as the major driving force behind organisation strategy that knowledge is a fundamental factor behind any organisation's success (Wiig, 1997). The emphasis on knowledge creation, development, organisation and advantage is the focus for improving society (Talebi and Galekandi, 2013). The purpose of this study is to investigate the different approaches to knowledge sharing and knowledge transfer on projects.

The study takes place in South Africa in the Western Cape region and focuses on project teams in the Investment and electronic payment industries. The study focuses on which knowledge tools are used, and how these are measured for their effectiveness.

Value of study

The study explores the popular research areas of Knowledge Management (KM), Knowledge Sharing (KS) and

*Corresponding author: Email: Naickv@unisa.ac.za. Tel.: 021-5510994 Mobile: 0835576805.

Knowledge Transfer (KT). Thereafter, the study investigates how the research areas can be explored and utilised with efficacy in an Information Systems (IS) project environment. The study also highlights the barriers to the sharing of knowledge in IS-project teams. The study takes a closer look on knowledge sharing approaches that have been used with its challenges and compares knowledge sharing approaches within the team.

Research question

What are the most effective knowledge-sharing approaches for projects?

Literature review

In order to provide an informed view of this research, the literature review has been categorised into the various relevant headings. These are discussed below.

Understanding Knowledge

Knowledge is commonly acknowledged as an important economic resource in today's economy (Bou-Llusar and Segarra-Ciprés, 2006; Søndergaard et al., 2007). It is becoming increasingly evident that organisations should acquire knowledge that is useful and relevant, in order to retain their competitive advantage (Long et al., 2012). Knowledge management (KM) is defined as the exploitation and development of the knowledge assets of an organisation – with a view to furthering the organisation's objectives (Davenport et al., 1998). The bulk of knowledge management literature is primarily concerned with the role of information technology, however organisations that has information technology to manage explicit knowledge may have neglected more important and challenging tasks of facilitating the sharing and utilisation of tacit knowledge (Holste and Fields, 2010). Explicit knowledge is knowledge that is easy to transmit, and can be expressed in various communication mediums, such as words and numbers. Tacit knowledge is knowledge that is held implicitly in the minds of people, which is intricate to articulate, and requires observation, demonstration and experience for its transfer. Knowledge, whether tacit or explicit, is shared in a process, known as the "knowledge spiral". This process comprises four stages: socialisation, externalisation, combination, and internalisation ((Nonaka and Takeuchi, 1995)), where tacit knowledge is elicited, exploited and shared. There can be no growth for the organisation if there is no learning from knowledge that has been shared (Nonaka and Takeuchi, 1995). This would be detrimental to the organisational advancement, which could adversely affect strategy delivery, as well as customer perception and brand integrity.

Knowledge Sharing and Knowledge Transfer

The terms Knowledge Sharing (KS) and Knowledge Transfer (KT) are often discussed by many authors interchangeably as the term "knowledge sharing" (Liyanage et al., 2009). Knowledge sharing is a people-to-people process (Ryu et al., 2003). It is a two-way process where individuals mutually exchange their knowledge. Knowledge transfer involves either actively communicating to others what one already knows, or actively consulting others, in order to learn what they know (Van Den Hooff and De Ridder, 2004). Knowledge transfer in organisations is about identifying knowledge that is accessible and acquire it to make things more efficient and effective in organisations. Therefore, Knowledge Sharing (KS) in organisations mostly involves exchange of knowledge at the individual level. Knowledge transfer in organisations is about identifying knowledge that is accessible, how to acquire and absorb it well and subsequently, how to make things more efficient and effective in organisations (Liyanage et al., 2009). Knowledge sharing is a daily process in an organisation. The above merely serves to formalise and structure this very basic but critical process.

Through the research, it became apparent that the two main categories of KS methods could be identified as people-engaging and systems-enabling methods ((Doctor, 2007; Ismond and Shiri, 2007). People-engaging methods results in tacit knowledge beingshared amongst individuals, whilst systems-enabling methods enable the tacit knowledge to be elicited. Once this tacit knowledge has been captured, it is then shared at the organisational level promoting knowledge sharing provides users with more personalised, responsive and integrated information systems which is mutually beneficial both to the organisation and the users (Reneker, 2000). Workers on projects are at the forefront of a variety of new technologies and as a result must be supported by organisations by improving their intellectual capital and experiences. This in turn contributes to maximising competitiveness and innovativeness (Ling, 2011).

Knowledge transfer in a project team is important for accomplishing specific project tasks (Sandhu and Gunasekaran, 2004). It offers the opportunity to continuously improve the organisation's performance – through knowledge and organisational learning. Knowledge transfer (KT) is about exploiting accessible resources and also about how to acquire and absorb it to make things more efficacious (Liyanage et al., 2009). Transferred knowledge could easily change in shape, form and appearance from the source to the receiver, and a need to interpret the knowledge in a meaningful way. The nature of project teams is generally to move on after the success of a IS project, it is important to have a means to

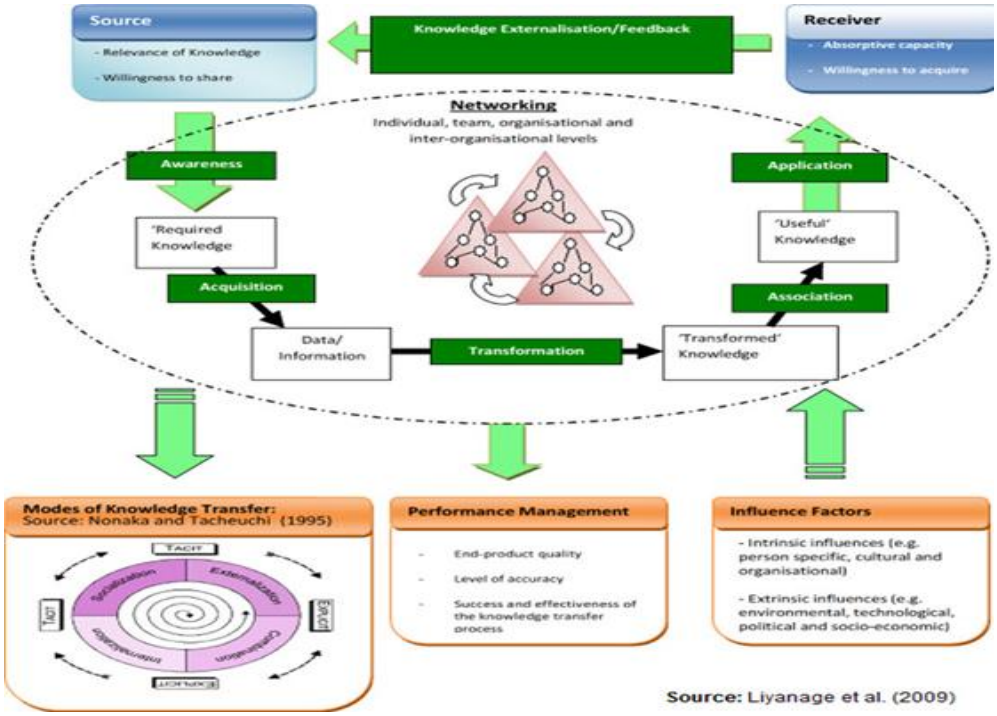


Figure 1: Knowledge transfer process adapted from Liyanage et al. (2009).

transfer knowledge.

Many consider explicit knowledge as equivalent to information, however recorded knowledge is argued to be richer than information as it is a reflection and the result of collated increments of information, which in this context is specific to a situation on which data has been collected and organised to give a meaningful interpretation about the specific situation (Kebede, 2010). Liyanage et al., (2009) proposed a six-stage KT process model (Figure 1) for knowledge transfer by looking at knowledge in two particular aspects: how knowledge is communicated and how it is translated throughout the knowledge transfer process – between the source and the receiver. The authors findings illustrate how the knowledge transfer loop is communicated by either interacting with people, or actively consulting others, in order to learn what they know. They also illustrate how knowledge is translated by transforming knowledge in a meaningful way into a form where the receiver can use it effectively.

Kumar and Ganesh (2009) have explored the diversity of the existing body of literature on knowledge transfer which can be utilised to identifying gaps in the organisations knowledge-transfer strategies. The researchers further provide in-depth view of the knowledge-sharing landscape, illustrating research on the different dimensions of knowledge sharing, knowledge-sharing cultures; effects on individuals and teams and organisations. It also serves as representations of the intricate flow of information, the mechanisms used, and the geographical dimensions of knowledge sharing, especially when considering project team members. Furthermore, it is also to evaluate the knowledge sharing approaches to business performance as knowledge sharing approaches are becoming more complexed rather than simple tasks (Carrillo et al., 2003).

Knowledge tools and knowledge-sharing measurements

Generally, knowledge is maintained by highly experienced or intelligent individuals, which are normally under pressure to deliver (Smith 2007). Workers on project teams are generally at the forefront of IS projects when there is an expectancy for specific deliverables on IS projects. Examples of knowledge sharing tools that are commonly used by organisations are online web tools, electronic database systems and expert locator systems. Supporting these knowledge tools are beneficial in an organisation (Smith 2007).

The literature reveals that knowledge tools and knowledge innovation for the organisation (Smith 2007). Most knowledge tools and knowledge portals yield positive impacts on knowledge sharing (Doctor, 2007; Koulouris and Kapidakis, 2005) Careful consideration must be given of the type of KM tool, because the technology tool alone cannot achieve the KM strategy (Endres et al. 2007). The measurement of these knowledge tools varies, in that they all serve

organisational strategies with specific objectives, depending on the level of intricacy that is required for the organisation's KM strategy.

Knowledge Barriers

Organisations, who want to maintain their competitive advantage, must do so by determining how people, the organisation structure and internal processes, stakeholder relationships and the business environment all relate to each other. Knowledge barriers can then be identified and eliminated in order to create an optimal knowledge-sharing environment (Paulin and Suneson, 2012). Knowledge transfer barriers that occur in organisations can be categorised into three types, namely: individual, organisational and technological barriers (Riege, 2007). Szulanski, (1996) mentioned four stages (*Initiation, Implementation, Ramp-up and Integration*) of KT to identify possible barriers during the knowledge-transfer process. Individual barriers can exist where there is a lack of any clear commitment and intent to create an environment that is conducive to knowledge sharing and also cultural incompatibilities (Dulaimi, 2007). The willingness of the individual to contribute to knowledge sharing could enable the organisation to improve its innovative capability (Lin 2007). Trust between individuals in an organisation can be both an enabler and a barrier to knowledge sharing; as a lack of trust might reduce the knowledge-sharing contributions made by the individuals (Søndergaard et al., 2007). Bakker et al., (2006) suggest that team membership has the largest effect on the density of knowledge sharing. Stakeholders' involvement is pivotal to the success of knowledge management (Sandhu and Gunasekaran, 2004) and lack of stakeholders' involvement could well lead to a failure in the knowledge-management strategy. The lack of engaging in best practices would not necessarily breed inventiveness that could deliver more effectively by sharing knowledge and expertise (Grisham, 2006; Perez-Araos et al., 2007). It is suggested that the KM strategy should best be integrated into the overall organisational strategy, thereby supporting ongoing organisational activities (Christensen 2007; Neumann and Tomé, 2011) Finally, technology alone cannot thrive without being nurtured by those who use it. The involvement of the users is pivotal to the success of knowledge management (Grisham, 2006). Furthermore, the alignment between process and information-sharing technologies is important for co-operative work on projects (Sandhu and Gunasekaran, 2004).

Research Design

The study is a quantitative survey conducted with project teams in organisations that offer business services in the Investment and electronic payments industries. The sampling group was randomly selected people across business units, in order to measure the knowledge-sharing activities on projects. During the pilot phase of the questionnaire design, a greater percentage of participants indicated that they were not always privileged to have access to the internet. As a result, the questionnaire was retrofitted into an email questionnaire instead of an online survey tool and circulated to project teams. This resulted in a potential target sample of almost 100 participants, each with a specific role on a project. The email based survey received a 14 percent response rate in comparison to a targeted email survey study where only 20 percent response rate was received (Jackson & DeCormier 1999). The preference of an email questionnaire can be deemed as a limiting factor for response rates of the survey. However when reviewing previous research with the uptake between web questionnaires over email questionnaires, the results illustrate that web over email questionaires are at a minimal advantage in terms of response percentages (Romano, 2002). Some authors have argued that web surveys are not an improved replacement to email questionnaires (Lippert, 2002; McDonald and Adam, 2003). Web surveys in itself held a small percentage of responses (Basi, 1999). Despite these limitations, we believe that our results do reflect important aspects in our understandings of knowledge sharing on projects and contributes to the body of knowledge. Similar studies regard the low response rate of surveys has contributed to their respect knowledge areas (Ha and McGregor, 2013; Isik et al., 2011; Ranchhod and Zhou, 2001; Sandweiss et al., 2012). The 14 responses received were from project managers, business analysts and developers, which translated to a response rate of 9.28% of the potential 100 participants. The proportion of respondents was males: 71% and females 29%, the majority of 71% being under the age of 40, whilst 29% where between the ages of 20-30 years. The majority of 86% had obtained a degree or diploma, with 14% having obtained a Honours or Master's degree. In terms of length of service, 65% of the respondents had been less than 3 years with the organisation; 7% between 4 and 7 years; 14% between 8-10 years; and 14% over 11years. These comprised a balanced combination of job function, as well as a permanent 57%vs contracted 43%employees. The respondents' job functions were split between 36% of Project Managers, 36% of Business Analysts and 28% of Developers.

Measurement

The survey was constructed into four main categories: people-centric knowledge-sharing methods, experience of project-team members, the system-enablement KS tools used, and the role played by trust and culture from an individual and organisational perspective. Subsequently, the open-ended questions allowed the participants to provide information that is tacit and not covered by the closed-ended questions. This was namely, what the participants' perception of knowledge sharing is; what tools and techniques are used in their current environment and how they perceive intellectual capital. All categories were measured using a 5-point Likert scale (Likert, 1932) to illustrate the views of the respondents, from strongly disagree to strongly agree.

Data Analysis

The majority of the questions were measured using a 5-point Likert scale (Likert, 1932), with only a few open-ended questions. The open-ended questions were to understand what the respondents interpretations were about knowledge sharing. To illustrate the general level of ratings, the median function was used to describe the measure of central tendency. To illustrate the most frequently rated score, the mode function was used. Thereafter, the vlookup function in Microsoft Excel was used to count the number of

respondents who scored the most frequently rated score, and this total was then divided by the total number of respondents – to indicate the percentage of the most frequently rated score. Furthermore, the mini- and maxi-functions were used to indicate the lowest and highest ratings scored from the data collected. The survey questionnaire was orchestrated because of the literature review, with the intent of addressing knowledge sharing indicators found in the literature review. The survey questionnaire was then segmented into various categories namely, knowledge sharing practices in teams, assessing if there was any specific software tools (e.g. knowledge portals, interwebs etc.), the use of system tools to share knowledge, to assess if there were any rewards and recognitions in place in the organisations for knowledge sharing, and lastly to assess the work environment and culture. The questionnaire is shown in Table 1, where it illustrates the most common rating, including the percentage of the most common rating of the respondents.

FINDINGS

The results indicated that there are knowledge-sharing processes to some extent. However, the culture of sharing knowledge was not well supported by management. This is an important aspect that can significantly improve knowledge sharing in organisations (Lin, 2007). The results indicated that there was a lack of mentorship and leadership, inadequate time, inadequate IT systems to support knowledge sharing, and a lack of appropriate reward and recognition. The survey also indicated that respondents were ambivalent towards the value and benefit of possessed knowledge and encouragement to establish relationships with internal and external knowledge sources. Five categories were identified that were attributed to knowledge sharing on projects, namely: knowledge sharing amongst team members, culture and trust associated with knowledge-sharing activities, system-enabled tools used amongst team members to share knowledge, rewards and recognition, and work environment.

Knowledge sharing in teams

Based on the findings, 72% of the respondents have agreed that their team members are supportive when creating and sharing knowledge which was supported by natural sharing habits that were evident. However, there was uncertainty on any existing mentorship and coaching to promote knowledge sharing including participation of contribution to knowledge sharing in forums and workshops for example. Another supporting finding is that 50% of the participants did not feel that there is sufficient time to share knowledge and adequate time to identify colleagues in need of specific knowledge. Neumann and Tomé, (2011) iterated the importance of KM strategies, and how it is incorporated as part of the main business strategy and that there are rewards and recognitions in place for efforts to contribute to the knowledge sharing activities.

Culture and trust

There is a 57% indication from respondents that the communication and interpersonal skills amongst their team members are at the right maturity level to share knowledge. Only 28.5% were neither in agreement or disagreement, which potentially indicates that the respondents were uncertain of the maturity of the communication and interpersonal skills amongst team members.

In regards to trustworthiness, 57% of the respondents were in agreement that they trust the individuals in their team and their transferred knowledge. But only 14.2% also strongly agreed with this statement; whilst 21.4% were in disagreement. The results indicate that 71.2% of the respondents collectively agreed that they were able to trust the knowledge of individuals in their team. Trust amongst team members are important to knowledge sharing contributions and can possibly limit knowledge sharing efforts (Søndergaard et al. 2007). A mere 35.7% acknowledged that there was a lack of willingness to share knowledge across organisational units within the same organisation.

System tools

43% of the respondents were in disagreement that there were the necessary IT systems and processes available in the organisation to support their knowledge-sharing requirements. 21% were in agreement that there were IT systems and processes for their knowledge requirements, whilst 21% were unsure if there were any IT systems and processes to meet their knowledge requirements. It has been found that system tools aid knowledge sharing efforts and has positive impacts on knowledge sharing activities (Ford 2006; Endres et al. 2007; Doctor 2007). Further investigation reveals that 14% were unsure in this instance. Only 14% were in agreement that there was any willingness to share, and only one was in strong agreement. There is an overall disagreement in terms of system-enabled tools being used to share knowledge amongst team members. 64% were in some form of disagreement as to having IT systems to facilitate knowledge sharing.

The lack of mentorship and leadership, rewards and recognition evident could be attributed to not having IT systems and tools in place to share knowledge, which is important to have in place for the KM strategy of an organisation (Sandhu and Gunasekaran, 2004).

.57% of the respondents were in some form of disagreement on having IT systems and tools available to share knowledge. An an opportunity to improve knowledge sharing efforts, must be founded with realistic expectations as technology alone cannot fulfil a KM strategy alone (Riege 2007; Ford 2006). The opened-ended question provided more specifics, since most of the respondents were using simple document

Table 1. Survey questionnaire

	Constructs	Most Rated #	Most-Rated Rating	% no. of votes
Knowledge sharing in teams				
Q1	A natural knowledge sharing habit is evident in the team	1	Agree	50%
Q2	Sufficient time is available to establish contacts and encourage relationships with internal and external knowledge sources	1	Disagree	50%
Q3	Social networking happens amongst team members	0	Agree	43%
Q4	There is time to share knowledge, and time to identify colleagues in need of specific knowledge	1	Agree	43%
Q5	Team members are supportive by assisting their peers for knowledge sharing & creation	1	Agree	71%
Q6	There is a post implementation review after the project	1	Agree	43%
Q7	Team members partake in forums, workshops and meetings to share knowledge	1	Disagree	50%
Q8	Mentorship and coaching exist in adequate formats to promote knowledge sharing	1	Disagree	57%
Culture and Trust				
Q9	Communication and interpersonal skills amongst team members are at the right maturity level for knowledge sharing	1	Agree	57%
Q10	Individuals and their transferred knowledge is trustworthy	1	Agree	57%
Q11	There is an awareness and realisation of the value and benefit of possessed knowledge to others	-1	Agree	36%
Q12	Knowledge sharing activities are apparent across different cultures	0	Neither	36%
Q13	There is a willingness to collaborate across organisational units within our organisation	-1	Disagree	36%
System Tools				
Q14	IT systems and tools are available for knowledge sharing activities	1	Disagree	50%
Q15	IT systems and tools support people's work processes and actual communication flows	-1	Disagree	50%
Q16	People's knowledge requirements are met by the IT systems and processes available	-1	Disagree	43%
Q17	Usage of IT systems and tools promotes knowledge sharing.	1	Disagree	57%
Rewards and Recognition				
Q18	There is a reward system in place for creating reusable knowledge resources	-1	Disagree	50%
Q19	My performance appraisal is linked to the knowledge that I am sharing.	-1	Disagree	29%
Work Environment				
Q20	The environment in my team facilitates knowledge storage and retrieval	1	Agree	36%
Q21	The physical work environment and layout of work areas are conducive to knowledge transfer	-2	Strongly Disagree	29%
Q22	Formal and informal spaces are in place to collaborate, reflect and generate new knowledge	0	Neither	29%
Q23	Organisational culture supports knowledge sharing activities	-1	Disagree	50%
Q24	Knowledge retention rates of highly skilled and experienced staff are evident in the organisation	1	Agree	43%
Q25	Resources and infrastructure to successfully support knowledge transfer practices are evident in the organisation	1	Agree	36%

repositories to store and share the knowledge.

Rewards and recognition

The rewards and recognition questions yielded the lowest ratings of all the questions in the questionnaire (means -1.0 and -1.5). 86% where in some form of disagreement that there was a reward system in place for creating reusable knowledge resources in the project teams This could also be attributed to the lack of time available, and of system-enabling tools to share knowledge. Although

78% indicated that there was a natural knowledge sharing habit in the respective teams), there was 93% uncertainty and disagreement that knowledge-sharing habits are linked to performance appraisals, which indicates that there is a lack of management involvement promoting such knowledge-sharing habits.

Work Environment

57% of the respondents where in some form of disagreement that organisational culture supports knowledge sharing activities, 43% agreed that knowledge retention rates of highly skilled and experienced staff are evident in their organisation; whilst 21% were in disagreement; and 21% were uncertain. Dulaimi (2007) indicated the importance organisation culture in knowledge sharing activities, and how cultural incompatibilities can act as a barrier to knowledge sharing efforts.

Managerial and leadership aspects proved to be a hindrance to the sharing of knowledge. As many as 43% disagreed that there was a hierarchical structure that promotes knowledge to flow between teams and business units. Further investigation resulted in a total low score for this question. This indicates the importance of having a sound KM strategy incorporated into the main organisational strategy (Rhodes et al. 2008). Only 14% strongly disagreed; whilst 14% were uncertain. The results indicate a hindrance to knowledge sharing to occur between teams and business units. 57% disagreed to some extent that leadership and managerial direction are clearly communicated with the benefits and values of knowledge-sharing practices, whilst 21% were uncertain.

The results indicate that there is a lack of leadership from managers to clearly indicate the benefits and values of sharing knowledge. 50% collectively agreed that stakeholders are involved to support knowledge sharing on projects, whilst 43% disagreed in certain degrees that there was no stakeholder involvement. This indicates slight variance in the difference of opinion amongst the team members.This supports the importance that stakeholders' involvement is pivotal to the success of knowledge management (Sandhu and Gunasekaran, 2004). In addition, the open-ended questions regarding the understanding of what knowledge sharing is, the respondents who commented had an understanding that knowledge sharing must be shared and accessible to everyone in the organisation, with sound best practices in place. The majority of the respondents commented that most of the knowledge repositories were in file servers – with some using electronic document repositories, such as SharePoint and share-drives. It is also evident that the respondents utilised basic folder search tools to trawl through these repositories for explicit knowledge that had been captured and documented. The electronic document repositories provide somewhat of an easier interface to search through the knowledge repositories. Respondents agreed that the intellectual capital belongs to the organisation, and felt that the knowledge that they were contributing belongs to their place of work.

DISCUSSION

The survey results indicate that there are sign of knowledge-sharing practices taking place in the workplace. However, there are opportunities for improvements to be implemented within project teams to promote effective knowledge-sharing habits. A similar study was also conducted across three teams within a healthcare organisation to attain a clearer understanding of knowledge exchange (Ward et al., 2012).

Overall, the results indicate that there is a strong presence of knowledge sharing amongst team members in the project teams by 72% of the respondents. The project teams involved felt that the knowledge that is shared is trustworthy and supported by mature and trustworthy individuals, which is indicated in the findings by 71%.This serves the organisation positively as the lack of trust could be a barrier to knowledge sharing (Søndergaard et al., 2007). There were no cultural issues evident that limited knowledge sharing in the teams, which is another positive factor as cultural barriers can limit knowledge sharing activities (McDermott 2001). 57% indicated the lack of leadership and 21.4% were uncertain. It is also evident that knowledge sharing across business units is not happening.

As the results have indicated, there is minimal or no leadership in place to drive knowledge-sharing initiatives. As seen in recent years, the majority of organisations are focusing on improving service delivery and customer experience. The Knowledge Management Strategy should have one of the key paradigm shifts of having not only a focus on the external customer – but to view internal customers (i.e. colleagues, cross-functional teams and members of other service-delivery areas as well) as key stakeholders.

What is suggested is that the organisation must consider all the factors and prioritise these as inputs to a comprehensive action plan. Another critical consideration is time management. Time is a critical currency, and it is recommended to use current meetings or forums – as opposed to creating more "meetings" for knowledge sharing. There seems to be a solid foundation of trust amongst team members as indicated in the results, and quick-wins would be to suggest to them how they believe the inadequate time factor as a risk could be mitigated.

This also creates many opportunities for mentoring, and once again, a proposal could be requested from the team members. In summary, people can work smarter and consequently, they could be happier. By giving them a problem to resolve, they feel as if they have been instrumental in finding the solution, which could lead to more buy-in. The organisation must realise the benefit of

having a knowledge-management strategy, timelines could be established to achieve the most effective knowledge-sharing approach in project teams. In the short-to-medium term, people-centric approaches could be explored to elevate the current knowledge sharing that is occurring in the project teams.

Limitations of this study

The limitations of this study was the low response rate because the majority of participants were contractors and deemed the survey as optional, and as a result the survey results cannot be generalised to all organisational contexts and populations. A similar article has been published with low response rates in an online survey (Isik et al., 2011). Organisations wishing to proceed with a survey of such nature for future studies, must understand the complexities and challenges involved and ensure participant involvement to attain more decisive results. The articulation and analysis presented in this study are our interpretation and our understanding of the survey results. In this regard, the study can be used as a basis for future conceptual generalisation studies. Hence, it needs to be clearly stated that this study cannot be generalised to the broader community.

Conclusion

The study reaffirmed that two knowledge-sharing approaches are identified as people-centric and system-enablement approaches. Each of these approaches varies in that each has a specific benefit to share knowledge and could be measured-depending on which approach has been used. Barriers limiting effective knowledge sharing on projects could be related to these types, namely: individual, organisational and technological barriers and these could include issues, such as cultural differences and trust. The survey results have illustrated that there is a strong presence of knowledge sharing amongst team members in the project teams across the Investment and electronic payments industries, where it is also evident that knowledge-sharing activities could be improved by having leadership and mentorship role-players involved. There is evidence that personal performance does not encourage knowledge sharing, having minimal time allocated to share knowledge; and thus, the work environments are not ideally seen as knowledge- sharing hubs. Furthermore, some people are strongly individualistic, and do not want to share their knowledge with others. Future research opportunities which can be expedited with a larger participant group and across different industries, which will aid the results to be more explicit. The study provides opportunities for future research by utilising the survey as a litmus test for participant who wishes to research Small Management Enterprises where knowledge sharing are more task orientated.

Conflict of Interests

The author(s) have not declared any conflict of interests.

REFERENCES

Bou-Llusar JC, Segarra-Ciprés M (2006). “Strategic knowledge transfer and its implications for competitive advantage: an integrative conceptual framework”, J. Knowl. Manage. 10(4):100-112.

Carrillo PM, Robinson HS, Anumba CJ, Al-ghassani AM (2003). “IMPaKT : A Framework for Linking Knowledge Management to Business Performance”, 1(1):1-12.

Davenport T, David W, Beers M (1998). “Successful knowledge management projects”, Sloan management review, available at: http://dialnet.unirioja.es/servlet/articulo?codigo=2498219 (accessed 15 September 2013).

Doctor G (2007). “Knowledge sharing: developing the digital repository of SIPS”, VINE, Emerald Group Publishing Limited, 37(1):64-73.

Dulaimi MF (2007). “Case studies on knowledge sharing across cultural boundaries”, Engineering, Construction and Architectural Management 14(6):550-567.

Endres ML, Endres SP, Chowdhury SK, Alam I (2007). “Tacit knowledge sharing, self-efficacy theory, and application to the Open Source community”, J. Knowl. Manage. 11(3):92-103.

Ford NJ (2006). “The development and evaluation of an information technology support system to facilitate inter-organisational collaboration in HRD”, J. Eur. Ind. Train. 30(7):569-588.

Grisham T (2006). “Nurturing a knowledge environment for international construction organizations through communities of practice”, Construction Innovation: Inform. Process, Manage. 6(4):217-231.

Ha H, McGregor S (2013). “Role of Consumer Associations in the Governance of E-commerce Consumer Protection”, J. Internet Commer. 12(1):1-25.

Holste JS, Fields D (2010). “Trust and tacit knowledge sharing and use”, J. Knowl. Manage. 14(1):128-140.

Van Den Hooff B, De Ridder JA (2004). “Knowledge sharing in context: the influence of organizational commitment , communication climate and CMC use on knowledge sharing” 8(6):117-130.

Isik O, Jones M, Sidorova A (2011). “Business intelligence (BI) success and the role of BI capabilities”, J. Int. J. Intell. Syst. Account. Finan. Manage. 18(4):161-176.

Ismond KP, Shiri A (2007). “The medical digital library landscape”, Online Inform. Rev. 31(6):744-758.

Kebede G (2010). “Knowledge management: An information science perspective”, Int. J. Inform. Manage., Elsevier Ltd, 30(5):416-424.

Koulouris A, Kapidakis S (2005). “Knowledge Management Policies on Digital Content of Libraries”.

Kumar JA, Ganesh LS (2009). “Research on knowledge transfer in organizations: a morphology”, J. Knowl. Manage. 13(4):161-174.

Likert R (1932). “A technique for the measurement of attitudes.” Arch. Psychol. 22(140):55.

Lin H-F (2007). “Knowledge sharing and firm innovation capability: an empirical study”, Int. J. Manpower 28(3/4):315-332.

Ling C (2011). “Culture and Trust in Fostering Knowledge-Sharing”, Electronic J. Knowl. Manage. 9(4):328-339.

Lippert S (2002). “Social Dynamics in Information Systems Survey Research: A Comparison of Administration Media”, Issues Trends IT Manage. Contemp. Organ. pp.462-466.

Liyanage C, Elhag T, Ballal T, Li Q (2009). “Knowledge communication and translation – a knowledge transfer model”, J. Knowl. Manage. 13(3):118-131.

Long C, Ghazali N, Rasli A, Heng L (2012). “The Relationship between Knowledge Sharing Culture and Innovation Capability: A Proposed Model” 2(9):9558-9562.

McDermott R (2001). “Overcoming cultural barriers to sharing knowledge”, J. Knowl. Manage. 41(4):76-85.
McDonald H, Adam S (2003). “A comparison of online and postal data collection methods in marketing research”, Market. Intell. Plann. 21(2):85-95.
Neumann G, Tomé E (2011). “The Changing Role of Knowledge in Companies: How to Improve Business Performance Through Knowledge”, Electronic J. Knowl. Manage. 9(1):73-84.
Nonaka I, Takeuchi TH (1995). The Knowledge-Creating Company : How Japanese Companies Create the Dynamics of Innovation: How Japanese Companies Create the Dynamics of Innovation, Oxford University Press p.304.
Paulin D, Suneson K (2012). “Knowledge Transfer, Knowledge Sharing and Knowledge Barriers-Three Blurry Terms in KM”, Electronic J. Knowl. Manage. 10(1):81-91.
Perez-Araos A, Barber KD, Munive-Hernandez JE, Eldridge S (2007). “Designing a knowledge management tool to support knowledge sharing networks”, J. Manuf. Technol. Manage. 18(2):153-168.
Ranchhod A, Zhou F (2001). “Comparing respondents of e-mail and mail surveys: understanding the implications of technology”, Market. Intell. Plann. 19(4):254-262.
Reneker MH (2000). “Enterprise knowledge portals: two projects in the United States Department of the Navy”, Electronic Libr. 69(6):21-403.
Rhodes J, Hung R, Lok P, Lien BY-H, Wu C-M (2008). “Factors influencing organizational knowledge transfer: implication for corporate performance”, J. Knowl. Manage. 12(3):84-100.
Riege A (2007). “Actions to overcome knowledge transfer barriers in MNCs”, J. Knowl. Manage. 11(1):48-67.
Romano MF (2002). “Determinants of Web mode choice in a ‘Web and paper ’ survey in a high education population Diogene : a longitudinal survey on Pisa graduates” pp.1-8.
Ryu S, Ho S, Han I (2003). “Knowledge sharing behavior of physicians in hospitals”, Expert Systems with Applications, available at: http://www.sciencedirect.com/science/article/pii/S0957417403000113 (accessed 15 February 2014).
Sandhu MA, Gunasekaran A (2004). “Business process development in project-based industry A case study”, Bus. Process Manage. J. 10(6):673-690.
Sandweiss DR, Kadish H, Campbell K (2012). “Outpatient management of patients with bronchiolitis discharged home on oxygen: a survey of general pediatricians.”, Clin. Pediatr. 51(5):442-446.
Smith K (2007). “Supporting e-learning in enterprise: the TE3 project”, Education+Training, Emerald Group Publishing Limited, 49(8/9):656-671.
Søndergaard S, Kerr M, Clegg C (2007). “Sharing knowledge: contextualising socio-technical thinking and practice”, Learn. Organ. 14(5):423-435.
Szulanski G (1996). “Exploring internal stickiness: impediments to the transfer of best practice within the firm”, Management 17:27-43.
Talebi B, Galekandi WK (2013). “Knowledge Management Application in Research Management” 10:124-130.
Ward V, Smith S, House A, Hamer S (2012). “Exploring knowledge exchange: a useful framework for practice and policy”. Soc. Sci. Med. 74(3):297-304.
Wiig KM (1997). “Knowledge Management: An Introduction and Perspective”, J. Knowl. Manage. 1(1):6-14.

academicJournals

Vol. 8(4), pp. 127-136, 28 February, 2014
DOI: 10.5897/AJBM2013.7211
ISSN 1993-8233 © 2014 Academic Journals

http://www.academicjournals.org/AJBM

African Journal of Business Management

Full Length Research Paper

A simulation method for Material requirement planning supply dependent demand and uncertainty lead-time

Haibatolah Sadeghi*, Ahmad Makui and Mehdi Heydari

Industrial Engineering Dept., Iran University of Science and Technology, Tehran, Iran, P.O. Box.1684613114

Received 6th September 2013; Accepted 6th February, 2014; Published 28th February 2014.

Materials requirements planning (MRP) is a widely used method for production planning and scheduling. Planned lead-time (PLT) and lot size are two of the input parameters for MRP systems, which determine planned order release dates. In this paper deals with material requirement planning for a three levels production and assembly system with several types of components and one type of final product, in multi periods. In this paper, we assume that components lead-times are probabilistic. A MRP approach with periodic order quantity (POQ) policy is used for the planning of components. The objective is minimizing the sum of the all components holding cost, final product backlogging cost, final product holding cost and setup costs. The main policies in this model determine the periodic order quantity, and planned lead-times. Monte-Carlo simulation is used to generate numerous scenarios based on the components lead time, and by using Monte-Carlo simulation we can find the suitable solution for this problem.

Keywords: planned lead-time; periodic order quantity; uncertainty, Monte-Carlo simulation; Probabilistic lead-time

Introduction

Material Requirements Planning (MRP) is a commonly accepted approach for replenishment planning in major companies (Axsater, 2006). The MRP-based software tools are accepted readily. Most industrial decision makers are familiar with their use. The practical aspect of MRP lies in the fact that this is based on comprehensible rules, and provides cognitive support, as well as a powerful information system for decision-making. Some instructive presentation approach can be found in Baker (1993); Sipper and Bulfin (1998); Zipkin (2000); Axsater (2006); Tempelmeier (2006); Dolgui and Proth (2010) and Graves (2011).In an industrial context, data are often imprecise or uncertain. In production management, it may for instance be the case for the demand, the lead-times, the resources required, their capacities, the transportation times, the inventory or production costs, etc. When analyzing the state of the art on this subject, so the uncertainty on the demand is a great focus of the literature, while the uncertainty on costs and capacities is also often considered. The uncertainty on the lead-times, which is often mentioned and may have an important impact on the performance of the Supply Chains, is quite seldom taken into account. Component requirement planning in assembly systems is crucial for the companies. By optimizing component supplies enterprises can generate large gains in efficiencies. For

Corresponding author: Email: sadeghi_haibat@yahoo.com; +989128702557

different reasons (machine breakdowns, transport delays, or quality problems, etc.), the component lead-times (time of component delivery from an external supplier or processing time for the semi-finished product at the previous assembly level) are often random. To minimize the influence of these random factors, firms implement safety stock, but excess stocks are expensive. So, the problem is to minimize stock while avoiding stock-out at the same time maintaining a high level of service thus minimizing the total cost. In contrast, if the stocks are not enough, we will face stock out and corresponding backlogging cost. Therefore, the problem is to minimize the total cost composed of holding and backlogging costs (Dolgui and Prodhon, 2007).

This paper deals with random lead-times. That means the time needed to receive a component may vary from its forecasted time. Lead-time uncertainty may results either some shortages or surplus in inventories. If actual lead-time is random, the planned lead-time can contain safety lead-time that is, the planned lead-time is calculated as the sum of the forecasted (or contracted) and safety lead-times. The latter should be formulated as a trade-off between over- stocking and stock out while minimizing the total cost. The search for optimal value of safety lead-time, and, consequently, for planned lead-time, is a crucial issue in supply planning with the MRP approach. The problem of planned lead-times optimization, when safety lead-times are used, has been given scant attention in the literature. In practice often, average values or percentiles of probability distributions of actual lead-times are used. Gupta and Brennan (1995) studied MRP systems using simulation; they showed that lead-time uncertainty has a large influence on the cost. The statistics done on simulations by Bragg et al. (1999) show that lead-times substantially influence the inventories. Whybark and Wiliams (1976) found the use of safety lead-time more efficient than safety stock.

Assembly systems with random component lead times and lot-for-lot-sizing policy were considered in some research. Yano (1987) considers a two-level assembly system with only two types of components at level 2 (sub-assembly) and one type of components at level 1 (final product assembly). In Tang and Grubbstrom (2003) a two component assembly system with stochastic lead-times (for components) and fixed finished product demand is considered. Ho and Lau (1994); Molinder (1997); Chaharsooghi and Heydari (2010), represent that lead-time is a principal factor foreseeing production and lead-time randomness affects seriously ordering policies, inventory levels and customer service levels. Louly and Dolgui (2002, 2004) consider the case of the objective function minimizing the sum of average holding and backlogging costs, while Louly et al. (2008) studies the case when backlogging cost is replaced with a service level constraint. Faicel (2009) considers supply planning for two-level assembly systems under lead-time uncertainties. It is assumed also that the lead-time at each level is a random discrete variable. The expected cost is composed of the tardiness cost for final product and the holding costs of components at levels 1 and 2. The objective is to find the release dates for the components at level 2 in order to minimize the total expected cost. For this new problem, a genetic algorithm is suggested. For the latter case, in Louly and Dolgui (2004), the Periodic Order Quantity (POQ) policy was modeled and some properties of the objective function were proven. These properties were used in Louly and Dolgui (2010) to develop a Branch and Bound algorithm and other research by Louly and Dolgui (2011) proposed a model for minimize the sum of the average item holding, finished product backlogging and setup costs. Their developed method can be used for the optimization of time phasing and periodicity for such a MRP system under lead-time uncertainties.

Mohamed-AlyLouly et al (2012) deals with item supply planning in assembly systems that is, where several types of items are needed to produce one finished product. The actual item lead times have random deviations, so they can be considered as random variables. MRP approach with Periodic Order Quantity policy is considered. The aim is to find the optimal MRP offsetting. The proposed model and algorithms minimize the sum of the setup and average holding costs for the items, while satisfying a desired service level.

Louly and Dolgui (2013) considers multi-period Material Requirement Planning (MRP) under uncertainties lead times with no major restriction on the type of the lead-time distribution. They proposed a model and algorithms, which minimize the sum of the setup and holding costs while satisfying a constraint on the service level and the aim of this model is to find the optimal MRP time phasing corresponding to each periodicity of the POQ policy while Sadeghi et al (2013) considers a multi period serial production system for one product and deals with the problem of planned lead-time calculation in a Material Requirement Planning (MRP) environment under probabilistic lead times. It is assumed that lead times for all stages have the same distribution with different parameters. A MRP approach with periodic order quantity (POQ) policy is used for the supply planning of components. The objective is to minimize the sum of fixed ordering, holding and backlogging costs. A mathematical model suggested and then an optimal planning lead-time, ordering quantity and periodic time are determined. Researches in two cases ordering (lot-for-lot and POQ) summarized in Table 1.

This paper deals with material requirement planning for three levels production/assembly system with several types of components and one type of product, in multi periods. We assume that components lead-times are probabilistic. A MRP approach with periodic order quantity (POQ) policy is used for the planning of components. A simulation algorithm is used to minimize the sum of the all components holding cost, final

Table 1: Lead-time uncertainly

Paper	Criteria	Parameters	policy	Type of system	Comments
Yano (1987)	Sum of holding and tardiness costs.	Safety stocks	lot-for-lot	two-level two-item	optimization algorithm
Chu et al. (1993)	sum of the holding cost for the components and the backlogging cost for the assembled product	Safety lead-time	lot-for-lot	*One- level* Multi-item	optimal values of the planned times for the single-period problem
OuldLouly and Dolgui (2004)	Holding and backlogging costs	Safety lead-time	Lot for lot	One- level Multi-item multi-period	Markovian model for a dynamical multi-period planning
Tang and Grubbström (2003)	Stock-out and inventory holding costs	Safety stocks	lot-for-lot	two-level two-item	Laplace transform
OuldLouly et al. (2008)	minimize the average holding cost for components while keeping a high customer service level for the finished product	planned lead-times	lot-for-lot	one-level Multi-item	Branch and Bound
Faicel Hnaien, Xavier Delorme, Alexandre Dolgui (2009)	minimize the sum of the holding costs for the components of two levels and the backlogging cost for the finished product	planned lead-times	lot-for-lot	two-level Multi-item	genetic algorithm optimization
Mohamed-AlyLoulyAlexandreDolgui (2011)	Sum of the average item holding, finished product backlogging and setup costs.	order periodicity and planned lead times	POQ	Single level Multi-item	Optimization
Louly, Mohamed-Aly et.al.(2012)	Minimize the sum of the setup and average holding costs for the items, while satisfying a desired service level.	Planned lead times	POQ	one-level Multi-item	Optimization
Louly, Mohamed-Aly et.al.(2013)	minimize the sum of the setup and holding costs while satisfying a constraint on the service level	Planned lead times	POQ	one-level Multi-item	Optimization
Sadeghi, H.et, al. (2013)	minimize the sum of fixed ordering, holding and backlogging costs	order periodicity and planned lead times	POQ	multi period serial production system	Optimization

product backlogging and setup costs.

Problem and model description

A multi period supply planning for three-level assembly systems, with multi components in level 2 and 3 is considered (Figure 1). In this paper, we suppose that, the demand per period is constant. The required quantity of each component is ordered at the beginning of each period, the demands are satisfied at the end of the period. The unit holding cost for each type of component and the unit backlogging cost for the final product are known. Lead-times for various component orders are independent and actual lead-time is probabilistic for all components. We used POQ policy for ordering.

The components lead times at each level are random discrete variables, and the finished product demand at

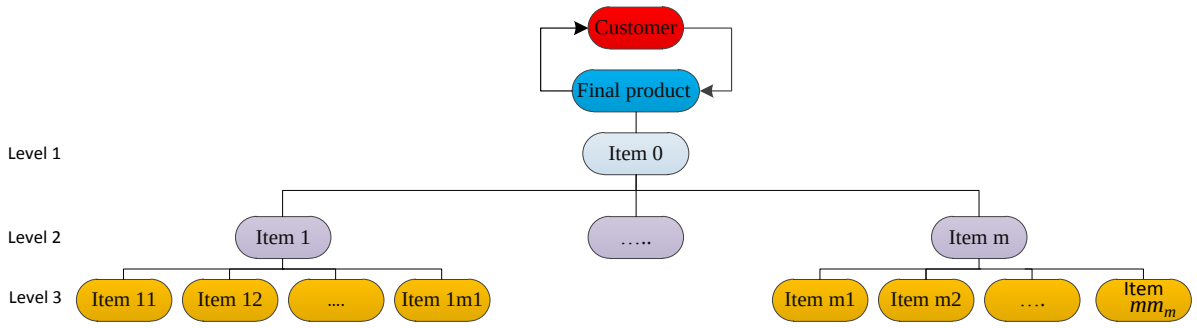


Fig.1: A tree-level assembly system

each period is fixed. Our endeavor is focused on the following: for each product, to calculate the planned lead times for its components, where the actual item lead times are uncertain. In other hand, production/assembly system is multi-period, in each production orders, we should ordered for needs of p periods, components are ordered each p periods, and Products are delivered at the end of each period. MRP approach with Periodic Order Quantity (POQ) policy is considered. The aim is to find the optimal planned lead time corresponding to each periodicity of the POQ policy. The objective is to minimize the sum of total holding cost for all components, final product holding cost, final product backlogging and setup costs. To take into account the particularities of MRP parameterization, the following assumptions will be considered in this paper:

a. Components are ordered from external suppliers to satisfy the customer demand.
b. POQ policy is used: components are ordered at every p periods.
c. The goal of this model is to search for the optimal values of the parameters p and x.

d. Probabilistic lead time for all components
Demand is constant for all period

The following notations are used for proposed model t : Index of period's t=1, 2, 3,…m:

Total number of component in level 2
A : fixed ordering cost,
x_0 : Planned lead-time in level 1,
x_i : Planned lead-time for component i in level2.
x_{ij} : Planned lead-time for component j in level 3 for parent i.
a_i : Quantity of component I needed to assemble the finished product
D : Demand for final product in period t
p : components are ordered at every P period in POQ policy
h : Per unit holding cost per time unit for final product
h_{ij} : unit holding cost for component j in level 3 for parent i.
b : Per unit backorder cost per time unit for final product
l_i : Actual lead-time for component in level 2(random variable with known probability distribution)
l_{ij} : Actual lead-time for component j in level 3 for parent i. (random variable with known probability distribution)
$f(l_{ij})$: The probability distribution of lead time for component j in level 3 for parent i.
$\hat{C}(x,p)$: The average of total cost in each period Variables
p: periodicity
x: planned lead-time for final product $(x=(x_0,x_1,x_2,\ldots,x_m,x_{21},\ldots.x_{2n}))$.

In the model considered, the demand D of finished products per period is constant and the quantities ordered are the same and equal to Dp, and a_i units of component i is needed to assemble one finished product. The periodic order quantity (POQ) policy issued, with a periodicity of p periods.
The unit holding cost h of final period, unit backlogging cost b of a finished product per period and set up cost c are known. The distribution of the component lead-time l_i is also known.
In this paper, an approach is proposed to optimize the planned lead-time x and the periodicity p of POQ policy minimizing the sum of setup and holding costs while respecting a service level constraint. The method suggested takes into account the fact that the actual lead times are random.

MATHEMATICAL MODEL

The lead-time is assumed probabilistic. The planned lead-time for component i in level 3 is x_{ij}, planned lead-time for component i in

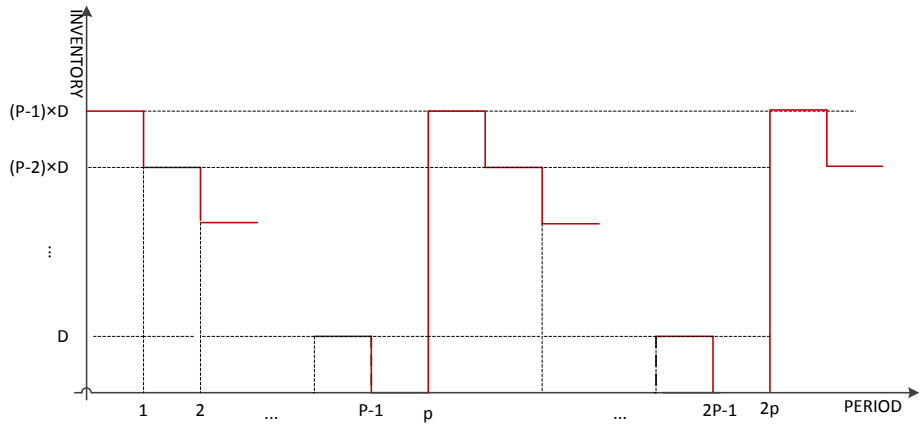


Fig .2: An illustration of the planning problem for final product

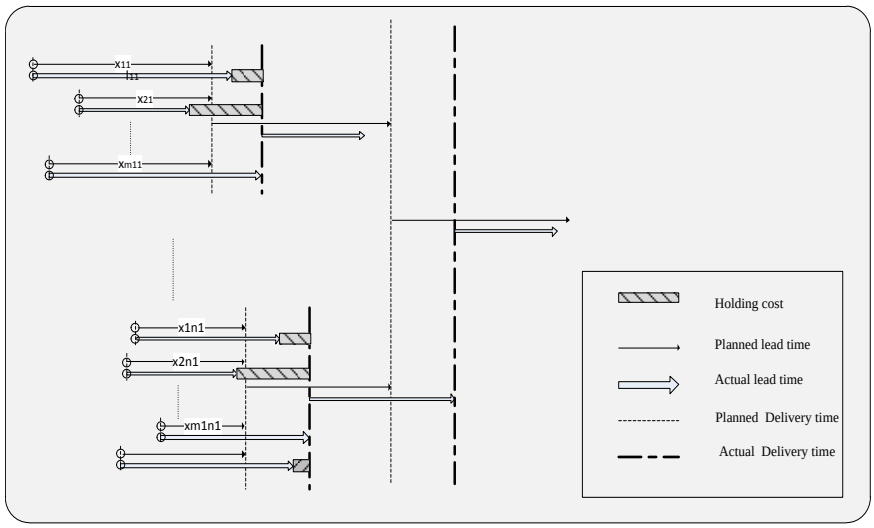


Fig. 3. An illustration of the planning problem.

level 2 is x_i $i=1,2,3,\ldots,m$ and planned lead-time for level 1 is x_0 .

The order for product is made at the beginning of the periods 1, p+1, 2p+1… and there is no order made in other periods. Order quantities are constant and equal to PD (Figure 2). Taking in to account the fact that the different components on the same level do not arrive at the same time, there are stocks at levels 1and2.Ifthefinalproductisassembledafterthedue date, there is backlog and therefore we have holding and backordering cost and if product is assembled before the due date, there is stocks and we have holding cost (Figure 3).

The objective is to find planning lead-time for all components and priority order, in order to minimize the total of the holding costs for the components and final product and backlogging cost for the final product.

The orders for products are made at the beginning of the periods 1, p+1, 2p+1,… and ordered for the needs of P period which is equal to PD for each ordering. According to Figure3, we have holding cost for some component in level 2, and for final product have holding, and backordering cost. Therefore, the costs of this model include holding cost for all components and final product, backordering cost for final product and fix order cost for each ordering.

Because of probabilistic lead-time, there are three states in action:

The planned lead-time for first level equal to actual lead-time in this level (see Fig .2)

This state has not backorder and model costs are equal to:

$$C_1(x,p)=\left[\overbrace{A}^{Setup\ cost}+\overbrace{(p-1)hD+(p-2)hD+\ldots+2hD+hD}^{Final\ product Holding\ cost}+\overbrace{D\sum_{i=1}^{m}h_i a_i\left(x_i+k-k_i-l_i\right)}^{Items\ Holding\ cost\ in\ level\ 2}+\overbrace{D\sum_{i=1}^{m}\sum_{j=1}^{m_i}h_{ij}a_{ij}\left(x_{ij}+k_i-l_{ij}\right)}^{Items\ Holding\ cost\ in\ level\ 3}\right]\times p(l_0=x_0) \quad (1)$$

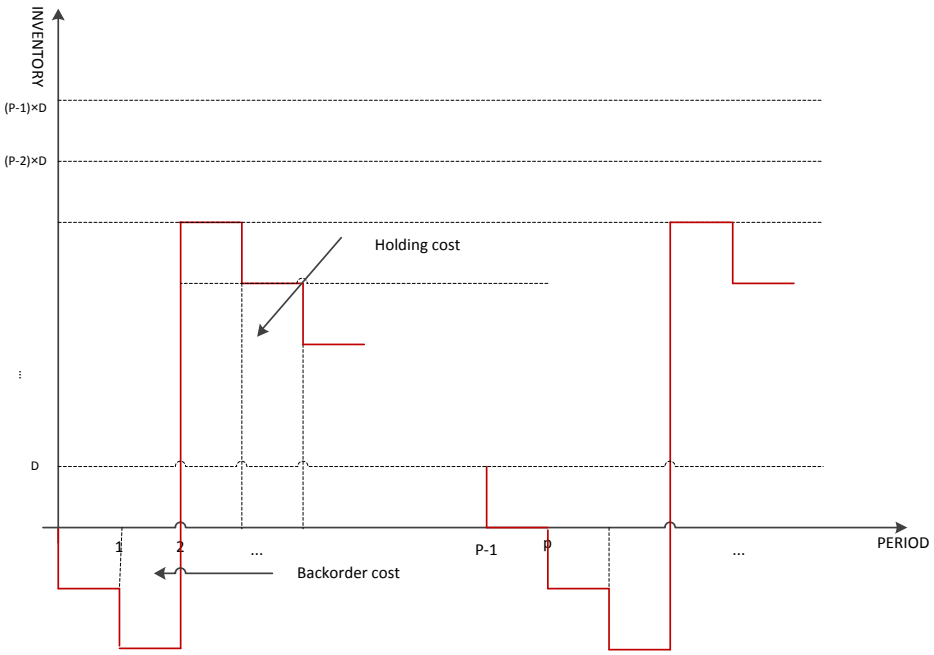


Fig. 4. The planned lead-time is smaller than to actual lead-time for first level

$$\Rightarrow\ C_1(x,p)=\left[A+\frac{p(p-1)}{2}hD+D\sum_{i=1}^{m}h_i a_i\left(x_i+k-k_i-l_i\right)+D\sum_{i=1}^{m}\sum_{j=1}^{m_i}h_{ij}a_{ij}\left(x_{ij}+k_i-l_{ij}\right)\right]\times p(l_0=x_0) \quad (2)$$

Where $k=Max(l_i-x_i)$, $k_i=\underset{j}{Max}(l_{ij}-x_{ij})$

The planned lead-time for first level is smaller than to actual lead-time for first level. If the final product is assembled after the due date, there exists backlog (Figure 4).

In this state, the cost is equal to:

$$C_2(x,p)=\left[\overbrace{A}^{Setup\ cost}+\frac{\overbrace{(p-(l_0-x_0+k))(p-1-(l_0-x_0+k))}^{Final\ product Holding\ cost}}{2}hD\right]\times P(l_0>x_0-k)$$
$$+\left[\frac{\overbrace{bD\frac{(l_0-x_0+k)(l_0-x_0+k+1)}{2}}^{Final\ product Backordering\ cost}}{2}\right]\times P(l_0>x_0-k)$$
$$+\overbrace{D\sum_{i=1}^{m}h_i a_i\left(x_i+k-k_i-l_i\right)}^{Items\ Holding\ cost\ in\ level\ 2}+\overbrace{D\sum_{i=1}^{m}\sum_{j=1}^{m_i}h_{ij}a_{ij}\left(x_{ij}+k_i-l_{ij}\right)}^{Items\ Holding\ cost\ in\ level\ 3}P(l_0>x_0-k) \quad (3)$$

Where $k=Max(l_i-x_i)$, $k_i=\underset{j}{Max}(l_{ij}-x_{ij})$

The planned lead-time for first level is bigger than the actual lead-time for first level (Figure .5).

In this state, the cost is equal to:

$$C_3(x,p)=\left[\overbrace{A}^{Setup\ cost}+\frac{\overbrace{p(p-1)}^{Final\ product Holding\ cost}}{2}hD+hpD(l_0-x_0+k)\right]\times P(l_0<x_0-k) \quad (4)$$
$$+\left[\overbrace{D\sum_{i=1}^{m}h_i a_i\left(x_i+k-k_i-l_i\right)}^{Items\ Holding\ cost\ in\ level\ 2}+\overbrace{D\sum_{i=1}^{m}\sum_{j=1}^{m_i}h_{ij}a_{ij}\left(x_{ij}+k_i-l_{ij}\right)}^{Items\ Holding\ cost\ in\ level\ 3}\right]\times P(l_0<x_0-k) \quad (4)$$

Where $k=Max(l_i-x_i)$, $k_i=\underset{j}{Max}(l_{ij}-x_{ij})$

Total costs are expressed as follows:

$$C(x,p)=C_1(x,p)+C_2(x,p)+C_3(x,p)=$$
$$A+\left(\frac{p(p-1)}{2}hD+hpD(x_0-l_0-k)\right)\times P(l_0\le x_0-k)+\left(bD\frac{(l_0-x_0+k)(l_0-x_0+k+1)}{2}\right)\times P(l_0>x_0-k)$$
$$+\frac{hD(p-l_0+x_0-k)(p-l_0+x_0-k-1)}{2}\times P(l_0>x_0-k)+p\left[D\sum_{i=1}^{m}h_i a_i\left(x_i+k-k_i-l_i\right)+D\sum_{i=1}^{m}\sum_{j=1}^{m_i}h_{ij}a_{ij}\left(x_{ij}+k_i-l_{ij}\right)\right] \quad (5)$$

With simplified cost function, it changes as follows:

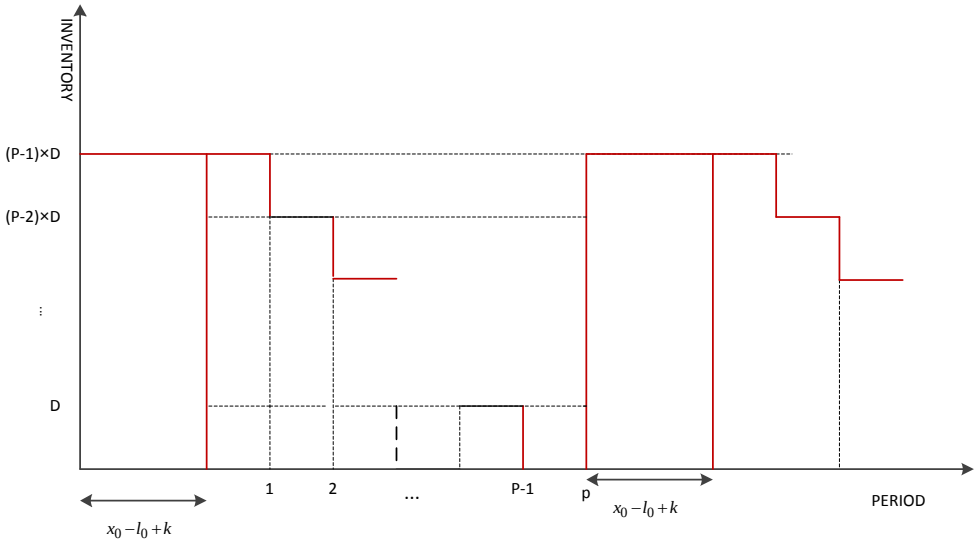


Fig. 5. The planned lead-time is bigger than the actual lead-time for first level

$$C(x,p) = A + \left[\begin{array}{l} \dfrac{p(p-1)}{2} hD + hpD \times E(x_0 - l_0 - k) + p\left[D\sum_{i=1}^{m} h_i a_i \left(x_i + k - k_i - l_i\right) + D\sum_{i=1}^{m}\sum_{j=1}^{m_i} h_{ij} a_{ij} \left(x_{ij} + k_i - l_{ij}\right) \right] \\ + \dfrac{D}{2}(h+b)\left[(l_0 - x_0 + k)^2 + (l_0 - x_0 + k)\right] \times P(l_0 \geq x_0 - k) \end{array} \right] \quad (6)$$

As shown in the previous proposition, the cost of a single period kp + r is a random variable. To study the considered multi- period problem, explicit closed forms should be obtained for the average cost and the average number of shortages on the infinite horizon, i.e. for the following expressions:

$$\hat{C}(x,p) = \lim_{r\to\infty} \sum_{t=1}^{r} \frac{C(x,p)}{p \times r} \Rightarrow$$

Then by using Eq. (6), the expressed unit cost will be as follows:

$$\hat{C}(x,p) = \frac{A}{p} + \left[\begin{array}{l} \dfrac{(p-1)}{2} hD + hD \times E\left[(x_0 - l_0 - k)\right] p\left[D\sum_{i=1}^{m} h_i a_i \left(x_i + k - k_i - l_i\right) + D\sum_{i=1}^{m}\sum_{j=1}^{m_i} h_{ij} a_{ij} \left(x_{ij} + k_i - l_{ij}\right) \right] \\ + \dfrac{D}{2p}(h+b)\left[(l_0 - x_0 + k)^2 + (l_0 - x_0 + k)\right] \times P(l_0 \geq x_0 - k) \end{array} \right] \quad (7)$$

The cost $\hat{C}(x,p)$ is a random variable (because $l_0, l_1, \ldots l_m$ and k are random variables

Noted that x is planned lead-time for $p \times D$ components and l is actual lead-time for D components in one period then in the all equation x equal to $\frac{x_p}{p}$ which x_p is planned lead-time p periods.

RESULTS

Simulation method

The study objective is to integrate reliability analysis with expansion planning and dispatching decisions. To achieve this objective, we propose a simulation based optimization approach.

Monte Carlo methods provide a good means for generating starting points for optimization problems that are non-convex. In its simplest form, a Monte Carlo method generates a random sample of points in the domain of the function. We use our favorite minimization algorithm starting from each of these points, and among the minimizers found, we report the best one. By increasing the number of Monte Carlo points, we increase the probability that we will find the global minimizer. Thereby, the Monte Carlo simulation, as a random numerical simulation, becomes a validated method of treating a complex problem, which cannot be solved by general equations, or experimental analysis methods. The principle of the Monte Carlo simulation for statistical tolerance analysis is to use a random generator to simulate the variations of dimension tolerances.

We generate numerous scenarios considering the lead-

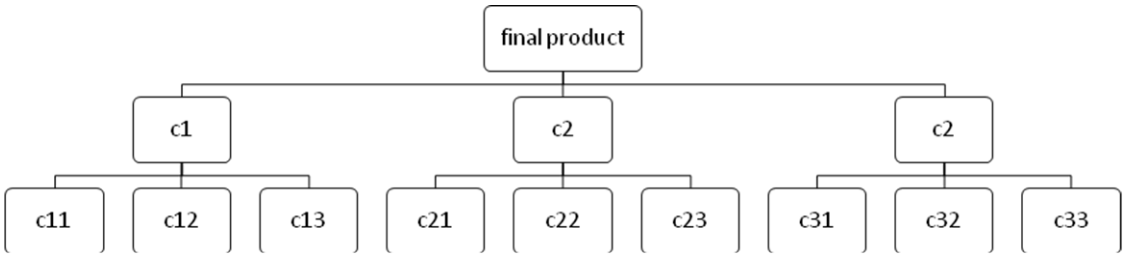


Fig. 6. The probability distribution and unit holding cost of lead-time for all components

Table 2: the probability distribution and unit holding cost of lead-time for all components.

level	Components	Lead time distribution	Unit holding cost
1	Final product	$U(5,15)$	20
2	1	$U(1,5)$	10
2	2	$U(2,7)$	12
2	3	$U(3,8)$	15
3	11	$U(5,10)$	4
3	12	$U(4,8)$	10
3	13	$U(5,12)$	1
3	21	$U(3,5)$	2
3	22	$U(3,10)$	12
3	23	$U(2,9)$	15
3	31	$U(9,12)$	9
3	32	$U(7,12)$	2
3	33	$U(5,10)$	5

time of components. Each scenario represents a random answer of components production time. For each scenario, components lead-time is generated randomly by lead-time distributions. The pseudo code of this algorithm is as follows:

Step 1:input all parameters include A,h,b, h_{ij} and set p=1

Step2: set j=1, $c_1 = \infty$

Step 3: generate random data for lead-time

$x_0 \leftarrow Random\ \ data\ with\ l_0\ destribution$

$x_i \leftarrow Random\ \ data\ with\ l_i\ destribution$

$x_{ij} \leftarrow Random\ data\ with\ l_{ij}\ destribution$

Step 4: Calculate total cost for this generation

Step5: If $C(p,x) < C_p$ then $C_p \leftarrow C(p,x)\ and\ x_p \leftarrow x$

$j \leftarrow j+1$, save $C_p\ and\ x_p$

Step 6: If the stopping criterion for j is met, stop and return $C_p\ and\ x_p$

Step 7: If $C_p < C_{p-1}$ then $p \leftarrow p+1$

then go to step 2

Else

C_{p-1} is minimum cost and x_{p-1} is the best answer

End

Example:

Consider the assembly system with two levels which there are 3 components in level 2 and 9 components in level 3. The probability distributions for all components and unit holding cost are shown in Figure 6 and Table 2. And other parameters are: A=100, b=5, h=10.

Solution:

We generate 10,000 scenarios considering the lead-time of components. Each scenario represents a random answer of components production time. For each scenario, components lead-time is generated randomly by lead-time distributions. In each scenario the total cost calculated and in result find minimum cost in 10,000

Table 3: Output of simulation

6	5	4	3	2	1	P
2631.9	2375.2	2353.6	2539.5	2547.1	2742	Minimum total cost
2601.6	2352.5	2257	2478.9	2456.2	2628.4	Total holding cost
13.6364	2.7273	71.5909	27.2727	40.9091	13.6364	Total backordering cost
78	70	48	39	26	15	x_0
12	10	20	6	4	1	x_1
42	20	12	21	14	5	x_2
24	30	12	12	8	5	x_3
54	35	32	27	18	7	x_{11}
24	35	28	12	8	7	x_{12}
36	25	32	18	12	6	x_{13}
18	25	12	9	6	3	x_{21}
18	15	20	9	6	6	x_{22}
48	10	28	24	16	4	x_{23}
66	55	36	33	22	11	x_{31}
48	40	36	24	16	11	x_{32}
60	40	28	30	20	10	x_{33}

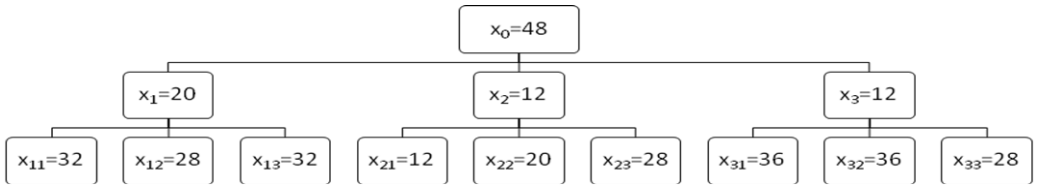


Fig. 7. Optimal solution

Table 4: The optimal solution for varies parameter's cost.

$C(x^*, p^*)$	p^*	b	H	A	P. No
2353.6	4	4	10	100	**1**
2453.6	4	4	10	**500**	**2**
2359.5	4	4	10	**1000**	**3**
3752.2	8	4	10	**10000**	**4**
3608.6	3	4	**20**	100	**5**
4284.5	3	4	**40**	100	**6**
6725.3	1	4	**100**	100	**7**
6725.3	1	4	**1000**	100	**8**
1569.1	5	**10**	10	100	**9**
2175.4	5	**50**	10	100	**10**
2594.4	5	**100**	10	100	**11**
2918	5	**1000**	10	100	**12**

scenarios.
The result of this simulation represent as follows (Table 3): Output of simulation

Optimal solution

The answer of this system is dependent to the cost parameters. For example if setup cost was very small rather than holding cost therefore the lot for lot ordering system is better. Figure 7 and Table 4 show the optimal solution for varies parameter's cost. According to the Table 3, with increase in the setup cost, the periodic time is increased. With increase in holding cost, the periodic time is increased and with increase in backorder cost, the periodic time is fixed.

Conclusion

In this paper considered with a model for optimizing the planned lead-time and order periodicity for production in multi-level production system with random lead-time for all components.

We generate numerous scenarios considering the lead-time of components. Each scenario represents a random answer of components production time. For each scenario, components lead-time is generated randomly by lead-time distributions. For each interaction, the total cost should be calculate and compared with prior total cost, if it is smaller than saved this cost. The proposed a simulation model to minimize the sum of the average holding cost, backlogging product and setup costs. This method, also can calculate the cost of the Lot for Lot policy. The cost of Lot for Lot order policy is when P equal to one. In this paper, a problem is solved to show the efficacy of cost parameter's on optimal planned lead-time and periodicity time. As a future research, one can consider the multi-level uncertainly MRP model, which cannot consider to it at all.

Conflict of Interests

The author(s) have not declared any conflict of interests.

Reference

Axsater S (2006). Planning order release for an assembly system with random operations times. ORSpectrum, 27:459–470.

Baker KR (1993). Requirement planning. In: Graves, S.C. (Ed.), Handbooks in Operations Research and Management Science, Logistics of Production and Inventory. North Holland, Amsterdam, 4:571–628.

Bragg DJ, Duplaga EA, Watis CA (1999). The effects of partial order release and component reservation on inventory and customer service performance in an MRP environment. Int. J. Prod. Res. 37:523-538.

Chaharsooghi SK, Heydari J (2010). Supply chain coordination for the joint determination of order quantity and reorder point using credit option. European J. Operational Res. 204(1):86–95.

Chu C, Proth JM, Xie X (1993). Supply management in assembly systems. Naval Research Logistics, 40:933-949.

Dolgui A, Prodhon C (2007). Supply planning under uncertainties in MRP environments: a state of the art, Ann. Rev. Control, 31:269-279.

Dolgui A, Proth JM (2010). Supply Chain Engineering: Useful Methods and Techniques. Springer.

Faicel H, Xavier D, Alexandre D (2009). Genetic algorithm for supply planning in two-level assembly systems with random lead-times; Engineering Applications of Artificial Intelligence 22:906–915.

Graves SC (2011). Uncertainty and production planning. In: Kempf, K.G., Keskinocak, P., Uzsoy, R. (Eds.), Planning Production and Inventories in the Extended Enterprise. A State of the Art Handbook. Series: International Series in Operations Research and Management Science, 151:83–102.

Gupta SM, Brennan L (1995). MRP systems under supply and process uncertainty in an integrated shop floor control. Int. J. Prod. Res. 33:205-220.

Mohamed-Aly Louly, Alexandre D, Faicel H (2008). Supply planning for single-level assembly system with stochastic component delivery times and service-level constraint; Int. J. Production Economics 115:236-247.

Mohamed-AlyLouly, Alexandre D (2011). Optimal time phasing and periodicity for MRP with POQ policy . Int. J. Prod. Econ. 131:76–86.

Mohamed-AlyLouly, Alexandre D, Abdulrahman A (2012). Optimal MRP offsetting for assembly systems with stochastic lead times: POQ policy and service level constraint; J. Intel Manuf. 23:2485–2495.

Mohamed-AlyLouly, Alexandre D (2013). Optimal MRP parameters for a single item inventory with random replenishment lead time, POQ policy and service level constraint; Int. J. Prod. Econ. 143:35–40.

Ould-Loudy MA, Dolgui A (2004). The MPS parameterization under lead-time uncertainty. Int. J. Prod. Econ. 90:369–376.

Sipper D, Bulfin Jr, RL (1998). Production Planning, Control, and Integration (New York: McGraw-Hill).

Sadeghi H, Makui A, Heydari H (2013). Determining the periodicity and planned lead time in serial-production systems with dependent demand and uncertain lead time. Uncertain Supply Chain Management, 1(2):87-98.

Tang O, Grubbstrm RW (2003). “The detailed coordination problem in a two-level assembly system with stochastic lead-times”. Int. J. Prod. Econ. 81/82:415-429.

Tempelmeier H (2006). Inventory Management in Supply Networks: Problems, Models, Solutions, and Books on demand GmbH.

Whybark DC, Williams JG (1976). Material Requirements Planning Under Uncertainty. Decision Science, 7:595-606.

Yano CA (1987). “Stochastic lead-times in two-level assembly systems”. IIE Transactions, 9(4):95-106.

Zipkin P (2000). Foundation of Inventory Management. McGraw Hill.

academicJournals

Vol. 8(4), pp. 137-145, 28 February, 2014
DOI: 10.5897/AJBM2013.7246
ISSN 1993-8233

http://www.academicjournals.org/AJBM

African Journal of Business Management

Full Length Research Paper

The effects of TMT interaction on enterprise performance from the perspective of enterprise culture

Xi Huai Liu[1,2*], Yu Hui GE[1] and QianNan Wang[1]

[1]Business School, University of Shanghai for Science and Technology, Shanghai, P. R. China.
[2]Department of Economy and Management, Zhoukou Normal University, Zhoukou, P. R. China.

Received 10th October 2013; Accepted 8th January, 2014; Published 28th February 2014.

The relationship between enterprise culture and enterprise performance and the relationship between top management team (TMT) and enterprise performance have been the hot topics which academy and business circles focused on since Pettigrew put forward the "organizational culture"; Hambrick and Mason proposed the "upper echelons theory". However, previous studies on the relationship between enterprise culture and enterprise performance and the relationship between TMT and enterprise performance were carried out according to two parallel lines, with almost no crossover studies on them. This paper will combine both of them together organically in order to study respectively the relationship between enterprise culture and enterprise performance, the relationship between TMT interaction and enterprise performance as well as the relationship between TMT interaction and enterprise culture and then put forward the research theoretical frameworks on the basis of reviewing previous studies on the enterprise culture, TMT and enterprise performance. Finally, the effect of TMT interaction on enterprise performance from the perspective of enterprises culture will be studied.

Key words: Enterprise culture, top management team (TMT), team interaction, enterprise performance.

INTRODUCTION

The biggest difference between management and leadership is that leadership pays attention to people-oriented management, cultural management, and emphasizes that people are the starting and end point of management; it is people-centered, respects people, trusts people, puts people at the dominant position of enterprise management; and advocates educating people by culture, paying attention to corporate mission, vision, core values, enterprise spirits, enterprise morality and responsibility to stimulate employees' enthusiasm, initiative and creativity in order to achieve the goals of organization. But, management emphasizes to command, control the behavior of employees in order to accomplish the goals of the organization mostly through coercive means. Real leadership is to establish a kind of follow up atmosphere, which is governed by non-interference. In order to realize organizational goals, the staffs are willing to follow the leader with voluntary efforts and happiness. Real leader-ship attaches great importance to corporate culture, authority, personal charisma to affect employees' behavior rather than to manage employees by power, all kinds of behavioral norms and system, control and even command. If employees work in these two quite different environments, the impact on corporate performance is self-evident, conceivable. Since Pettigrew put forward the "organizational culture", Hambrick and Mason proposed the "upper echelons theory", the relationship between organizational culture and corporate performance and the

*Corresponding author. E-mail: huaixi06@163.com. Tel: +86-15221898519.

relationship between TMT and corporate performance have been the hot topics which academy and business circles always focused on. However, previous studies on the relationship between organization culture and corporate performance and the relationship between TMT and corporate performance were carried out according to two parallel lines, with almost no crossover studies on them. In the studies on the relationship between corporate culture and corporate performance, few scholars considered the impact of TMT interaction on corporate performance and vice versa. This paper will combine both of them together organically in order to study deeply the relationship between corporate culture and corporate performance, the relationship between TMT interaction and enterprise performance as well as the relationship between TMT interaction and enterprise culture respectively and then put forward the research theoretical frameworks on the basis of sorting out previous studies on the corporate culture, TMT and cor-porate performance. Finally, this paper proposes the theoretical framework of impact mechanism of TMT interaction on enterprise performance from the pers-pective of enterprise culture, which is expected that, to some extent, to provide a theoretical basis for the future empirical research in related fields.

LITERATURE REVIEW

Corporate culture

Concept and structure of the enterprise culture

Pettigrew (1979) put forward the concept of organizational culture firstly; he thought that organizational culture is symbols, languages, religions, rituals and myths. Deal and Kennedy (1982) argued that most outstanding and successful companies had a strong corporate culture, and put forward the five elements of enterprise culture: enterprise environments, values, heroes, rituals, cultural networks, of which values are the core elements of enterprise culture. Schein (1985) elaborated systematically the concept of organization culture. He thought that enterprise culture is a set of values system formed during the process of all enterprise members' interaction, which is recognized by most of the enterprise members and used also to educate the new employees as a kind of means. He also put forward the development, function and change of enterprise culture as well as the basic theory of enterprise culture construction and divided culture into three layers: artifacts layer (on surface and visible products), espoused values layer (values), basic assumption layer (to learn something new requires resurrection, reexamination, frame breaking, hypothesis becoming reality, etc.). Hofsted et al. (1990) argued that the enterprise culture is symbols, heroes, ceremonies and values from the outside to the inside; in turn, value is is the core of enterprise culture, which mainly includes good and evil, beauty and ugliness, normal and abnormal emotional awareness, and so on.

Although domestic system research on enterprise culture started relatively late, based on the research results of western scholars, Chinese academy circle also explored the connotation and structure of enterprise culture through China's outstanding traditional culture and enterprise reality. Mingjie (1999) believed that corporate culture refers to the sum of values, group consciousness, behavior norms and thinking mode, which are formed during the long-term practice process and are generally accepted and voluntarily complied with by enterprise staff. Zhang (2003) discussed the connotation and structure of enterprise culture from material layer, system layer and spirit layer. Guangming (2002) discussed in detail enterprise culture from four layers (the material layer of surface layer, the behavior layer of the shallow layer, the system layer of the middle layer, the spirit layer of the deep layer) and further expounded the connotation from the broad definition and narrow definition as well as explicit and implicit culture.

The intrinsic effect mechanism of enterprise culture

Foreign scholars began to study the inner mechanism of the effect of enterprise culture from the mid-1980s after studying the conception and structure of enterprise culture. They explored the relationship between corporate culture and leadership, enterprise climate, enterprise environment, enterprise strategy and enterprise management process; they carried out quantitatively tracking study on the relationship between corporate culture and corporate performance. Cameron and Freeman (1985) who worked in School of Business Administration, University of Michigan researched the relationship between cultural integration, cultural power, culture type and organizational performance, using 334 research institutions as samples. Barney (1986) thought that if a company's enterprise culture is valuable, rare and imperfectly imitable, then the company's culture could be a source of sustained competitive advantage. Hofsted et al. (1990) studied deeply enterprise culture and enterprise performance, which showed that there was an important impact of enterprise culture on business performance, and predicted that enterprise culture is likely to become one of the key factors of the rise and fall of enterprise in future.

Studies on the intrinsic effect mechanism of corporate culture in China mostly focused on qualitative research about the guiding function, constraint function, incentive function, cohesive function, radiation function of corporate culture. Some scholars regarded corporate culture as a kind of "soft power" which could enhance the core competitiveness of enterprises. Some scholars studied the intrinsic effect mechanism of corporate culture through the relationship between corporate culture and enterprise performance.

Measurement, diagnosis and evaluation of enterprise culture

Studies on corporate culture in the Western paid much attention to the combination of qualitative and quantitative research, which put forward the model of corporate culture measurement diagnosis and assessment and thus developed a series of scale based on the theoretical studies on enterprise culture. Hofsted et al. carried out qualitative and quantitative research about enterprise culture using 20 companies as research samples. Zammuto and Krakower (1991) did qualitative and quantitative research on enterprise culture using the method of cluster analysis. Cameron et al. (1998) published monograph "diagnosis and changing corporate culture: the model based on competitive value theory", on the basis of competitive value framework CVF; they put forward the famous OCAI (Organizational Cultural Assessment Instrument) model, which provided effective measurement, diagnosis, assessment tool for the diagnosis of organizational culture and management ability and provided systemic methods for changing the organizational culture and individual behavior.

So far, the measure of enterprise culture in China also had some achievements. Guanghua School of Management, Peking University proposed 34 questions from 7 dimensions (fair punishment, care for staff, customer orientation, interpersonal harmony, social responsibility, normative integration, innovation) based on the measurement of enterprise culture in foreign countries. Economics and Management School of Tsinghua University proposed 40 questions from 8 dimensions (employee orientation, harmony orientation, customer orientation, action-orientation, innovation orientation, result orientation, control orientation, long-term orientation). Abroad corporate culture measurement scale had higher reliability and measuring validity. However, the relevant scale measurement of enterprise culture in China is still in development stage; it needs to be further strengthened in the development of scale.

Top management team (TMT)

At present, although the academy circles are divergent in the definition of TMT, there is such a consensus that TMT is composed of the chairman of the board of directors, general manager, deputy general manager, etc. who take part in the company's decision-making and possess the power of decision-making and control the enterprise management; and whose decision making functions are stronger compared with the ordinary work team. Previous studies on top managers and leaders almost focused on the individual characteristics, especially on the characteristics of the chief executive officer (or general manager), without centering around the characteristics of TMT. Until Hambrick and Mason (1984) put forward the concept of TMT, the scope of study was extended to the characteristics of the entire TMT. Research on TMT can be divided into two stages.

Hambrick and Mason (1984) discussed the impact of demographic characteristics of TMT on strategy and enterprise performance systematically and proposed the upper echelons theory model of organization from the perspective of demographic characteristics, which marked the beginning of the first stage of TMT research. At the beginning of the first stage, most studies focused on the impact of the observable demographic characteristics on strategy choice and corporate performance; studies on TMT psychological cognitive basis and value were very few. This was mainly because the cognitive basis, values, perception process were difficult to inspect and measure. The variables of demographic characteristics were more objective, more economic to explain organization, and more easily measured variables compared to the psychological cognitive variables (invisible). As a result, most studies focused on the impact of the observable demographic characteristics (such as functional experience, age, tenure, education background, other career experience, etc.) on the strategy choice and organization performance. During the mid and late period of the first phase, researchers began to focus on the heterogeneity of TMT demographic characteristics, which showed that in a stable environment, TMT homogeneity had positive effect on profitability; however, in the complicated and changeable environment, TMT heterogeneity had positive effect on profitability, and heterogeneity TMT was more creative than homogeneous TMT.

During the second stage, scholars mainly focused on the impact mechanism of TMT demographic characteristics on the strategy choice and organization performance from the perspective of TMT team process (interaction, communication, coordination, etc.) and situational regulating variable. Carpenter et al. (2004) improved the theoretical model that was put forward by Hambrick and Mason (1984), which emphasized the role of regulating variables in the model. Hambrick (2007) summarized four kinds of core situational regulating variables in the team process: freedom of management, job requirements, power configuration and behaviour integration, and studied respectively the impact of them on the strategy choice and the output of enterprise.

Scholars in China also studied TMT based on foreign research, by combining reality of the domestic enterprises; they achieved certain research results. Wenming and Shuming (2004) studied systemically the behaviour process of TMT from three aspects of "characteristic - Process - Environment"; Chongming and Xuefang (2007) studied the impact of TMT cohesion on the family business succession performance; Ge Yuhui (2011) studied the relationship between TMT human capital and the degree of differentiation of power distribution from perspective of human capital; Weizhong and Ge Yuhui (2012) made an empirical study on the impact of TMT

cognitive heterogeneity, emotional and task reflexivity on decision-making performance based on the information processing theory using 365 paired samples from 85 TMT teams.

Enterprise performance

Corporate performance is the concrete embodiment of enterprise management effectiveness and efficiency; to achieve good performance is the basis for enterprise survival and development and is also the fundamental reason for the existence of the enterprise. The connotation and measurement of corporate performance have been the hot topics which domestic and foreign scholars and business circles always focused on; however, there was much difference about the connotation and measurement of corporate performance, which have not formed the consensus; it is a benevolent person that sees benevolence, the wise sees wisdom.

Drucker was one of the earliest experts who researched enterprise performance evaluation; he put forward the enterprise performance 8 evaluation indexes by empirical research: profitability, productivity, physical resource and financial resource, market position, manager performance and development, employee performance and development, innovation ability, social responsibility. Ruekert et al. (1985) thought that enterprise performance included efficiency, effectiveness, adaptability; Venkatraman and Ramanujam (1986) thought that enterprise performance should be composed of three aspects: financial performance, operational performance, organizational efficiency.

There were many Chinese scholars who also studied enterprise performance and obtained certain achievements; e.g. Hongming (2005) believed that enterprise performance is the function and ability which organization itself has; he also created a very authoritative performance measurement scale from the profit and loss of economic income, the range of products and services, competition ability, etc. Min (2004) suggested that organizational performance was the degree of realizing the multiple goals which evaluated the organization; he also discussed the connotation and evaluation of enter-prise performance in detail from three aspects: organi-zation overall expression, organization goals and social common expectations. In this study, the author will take financial performance, market performance, social performance, innovation performance, employee satisfaction, etc as the measure indicators of corporate performance.

Effect of TMT interaction on enterprise performance from the perspective of corporate culture

Enterprise culture and enterprise performance

At present, there is a consensus in both the academy and business practice fields that excellence enterprise groups must have some special and distinctive culture, which can be a source of sustained competitive advantage and can form a kind of diving force and bring organizations to a higher strategic situation in the drastic business competitions until built to last.

Enterprise culture and cultural power

Enterprise culture is the soul of the enterprise core competitive ability, which, as a kind of soft power, contains a huge amount of energy, causes power of enterprise idea, enterprise strategy, action and enterprise image. These four powers unite as one to form a kind of huge driving force. Enterprise culture has an important impact on employees, customers and other stakeholders and thus has an important impact on the corporate performance through guiding function, constraint function, cohesion function, incentive function, radiation function, coordination function, education function and the function of setting up the enterprise image, etc.

Corporate culture and sustained competitive advantage

Barney (1991) pointed out that only those valuable, rare, imperfectly imitable resources can generate sustained competitive advantage when he discussed the relationship between firm resources and sustained competitive advantage in detail. As the intangible asset of an enterprise, distinctive, excellent enterprise culture just possesses these features; therefore, the outstanding enterprise culture can form a kind of culture driving force and produce a kind of sustained competitive advantage and thus achieve sustained superior business performance. As Barney (1986) said: firm culture can be a source of sustainable competitive advantage if that culture is valuable, rare, and imperfectly imitable. Therefore, if the enterprise culture in a firm wants to produce the core competitive advantage, to form the sustained core competitiveness, it must meet two conditions: on the one hand, the enterprise culture should be valuable, rare and imperfectly imitable, on the other hand, the enterprise culture must be recognized by enterprise employees and voluntarily abide by it.

As a kind of intangible asset, corporate culture can be the source of sustained competitive advantage only when it has value (i.e., can produce the efficiency and benefit in the enterprise management process). If enterprise culture does not have the attributes of value, then it cannot become the source of sustained competitive advantage, and does not have any impact on the enterprise performance, either. Other than the value attribute, enterprise culture also should have rare (unique) feature; otherwise, it could not become the source of enterprise sustained competitive advantage. If a kind of enterprise

culture is possessed by most firms in the same industry , then each firm will have the ability to develop the resources in the same way. We can take for granted that there is no competitive advantage and sustained competitive advantage for one firm. In addition, the imperfect imitation of the enterprise culture is also very important; only those firms that do not have certain corporate culture resource cannot obtain or imitate the corporate culture resource. Can the valuable and rare culture resource become a source of sustained competitive advantage? Finally, the enterprise culture should be recognized and kept by enterprise staffs, which is very important for the impact of enterprise culture on enterprise performance. Therefore, enterprise culture needs to fall to the ground according to the following aspects: 1) Internalization, namely employees should accept the enterprise culture from perception to cognition and then identify and engrave it in the depths of their soul and form individual value pursuit; 2) Externalization lies in action, that is to say, to change the value idea of enterprise culture into enterprise and workers action; it also lies on image, namely, externalization of enterprise culture shows the good corporate image not only through the employees actions, but also the unique cultural symbols which can shape and propagate the corporate image; 3).Groups, the enterprise culture should be agreed on by all staffs (or most) and form the group psychology; 4).Habituation, employees are in the long-term influence of corporate culture, become accustomed to the corporate culture over time.

The impact mechanism of enterprise culture on enterprise performance

The relationship between corporate culture and business performance has been an important topic which both academy and business practice fields focused on. Many domestic and foreign scholars believed that corporate culture has an important effect on corporate performance. In order to study the impact of mechanism of enterprise culture on corporate performance comprehensively, this paper discusses the impact of enterprise culture (mission, vision, strategy, enterprise values, norms, business ethics, social responsibility, etc.) on employees, customers and other stakeholders (stockholders, government, suppliers, etc.) from the perspective of the cultural force and sustained core competitiveness. Then the paper discusses the impact of enterprise culture on corporate performance (financial performance, market performance, social performance, innovation performance, employee satisfaction, etc.) from the perspective of employees, customers and other stakeholders.

The enterprise mission, vision and core values have condensation effect, incentive effect, guide effect which can produce a huge centripetal force and cohesive force to unite the staffs together closely, all of which not only can improve employees satisfaction to innovate voluntarily, but also can lead all staffs to strive to achieve the strategic goal of the organization, so as to improve the enterprise financial performance, market performance, etc. The enterprise culture, as the standard organization behavior, is an invisible binding force on the members of organization to restrain the behavior of organization members; it has two restraint force: one is the extern system restraint and other is the inherent cultural constraints. Although the system restraint is certainly mandatory, its role is limited. Once the corporate culture is approved by employees, it can form a kind of soft constraint, so as to achieve the highest realm of management; i.e., to achieve the purpose of management by non-interference. This kind of soft constraint can weaken the collision of employee psychologically, enhance the employee satisfaction, so as to improve the enterprise performance. In addition, the good enterprise culture, especially the social ethics and responsibility, has the role of setting up image, which can help to set up a good brand image to enhance corporate popularity and reputation that have an important impact on the attitude and behavior of the customer and other stakeholder, and thus improve enterprise performance. In summary, this paper puts forward the theoretical framework of the impact of mechanism of the enterprise culture on enterprise performance, as shown in Figure 1.

TMT interaction and corporate performance

Since Hambrick and Mason (1984) put forward the upper echelons theory, the relationship between TMT and corporate performance has been the hot topic that both academy and business circles focused on. Early in the first stage of TMT research, scholars mainly focused on the relationship between TMT observable demographic characteristics and strategy choice and firm performance. During the mid and late period of the first phase, researchers began to focus on the relationship between heterogeneity of TMT demographic characteristics and strategy choice and firm performance. During the second phase of TMT research, scholars began to pay attention to TMT psychological cognition, values to study the impact of TMT on the strategy choice and firm performance from the perspective of team process (such as communication, coordination, etc.). Therefore, previous studies on TMT were mostly around the chain process of "TMT-- Strategy -- enterprise performance", which emphasized the role of TMT on strategy making and business performance, while ignoring the influence of middle managers, first-line managers and staffs on the enterprise strategy and enterprise performance.

Indeed, TMT holds the absolute resources distribution and decision-making power in enterprise, which has very important influence on enterprise performance. However, if TMT pays attention to the interaction process (such as

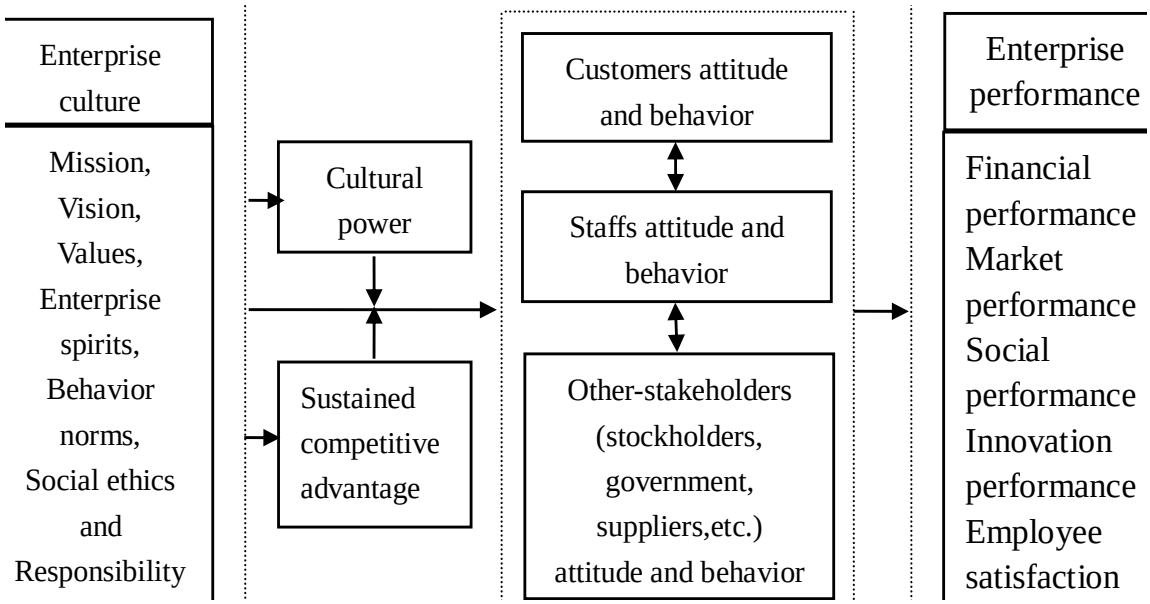


Figure 1. Theoretical framework of the impact mechanism of the enterprise culture on enterprise performance.

communication, coordination etc.) with middle managers, first-line managers and staffs in order to mobilize fully the enthusiasm of staffs at the "TMT--strategy" link, then the strategy quality which is made by TMT will be better. It is noteworthy that interaction within TMT also has an important impact on the enterprise strategy formulation. Therefore, in order to improve strategy formulation quality, TMT should pay attention to the internal interaction among TMT members and the interaction between TMT and subordinates during the process of enterprise strategy choice and formulation. In addition, enterprise performance is not only related with strategy formulation, but also with the strategy effective implementation that is an important part which cannot be ignored. If TMT are effective decision makers, then middle managers, first-line managers and employees are the effective strategy performers. Strategy itself can not realize the enterprise performance; only through the effective strategy implementation can strategy value and expected performance goals be realized. In order to improve the effective implementation force of the strategy and to better achieve the strategic goals which are drawn up by TMT, TMT must pay attention to the interaction process among TMT, middle managers, first-line managers as well as staffs. It is noteworthy that strategy decision-making and firm performance may be affected by lots of influencing factors. For the purpose of this study, this paper only discusses the impact of TMT on strategy decision making and enterprise performance from the perspective of team process. In summary, this paper puts forward the theoretical framework of the relationship between TMT interaction and business performance, as shown in Figure 2.

TMT interaction and enterprise culture

Schein (1983) believed that the values, management concepts, management ideas, management philosophy, leadership styles of the founder and top leaders play an important role in the formation of corporate culture; however, enterprise culture is not the culture of leaders and boss culture; only most employees that recognize and identify it can form the driving force of culture and become the source for the enterprise to have sustained competitive advantage. Then, how can the enterprise culture be accepted, identified and consciously abide by it? TMT interaction is a good way. This paper will discuss the relationship between TMT interaction and enterprise culture from following two aspects.

TMT Internal Interaction

TMT Internal Interaction mainly refers to the interaction among the enterprise main shareholders, chairman, general manager (CEO), vice general managers (executive vice presidents). In order to make the enterprise mission, vision, core values, enterprise spirits, business ethics, social responsibility be accepted, identified by all staffs, all the members of TMT should accept, identify and form consensus firstly; otherwise, it is impossible for the enterprise culture to be popularized in all employees. In a sense, a firm enterprise culture is just the concentrated reflection of entrepreneurs' values, management concepts, management ideas, management philosophy**,** leadership styles. TMT members will form cognitive differences even if it is cognitive conflict because of their

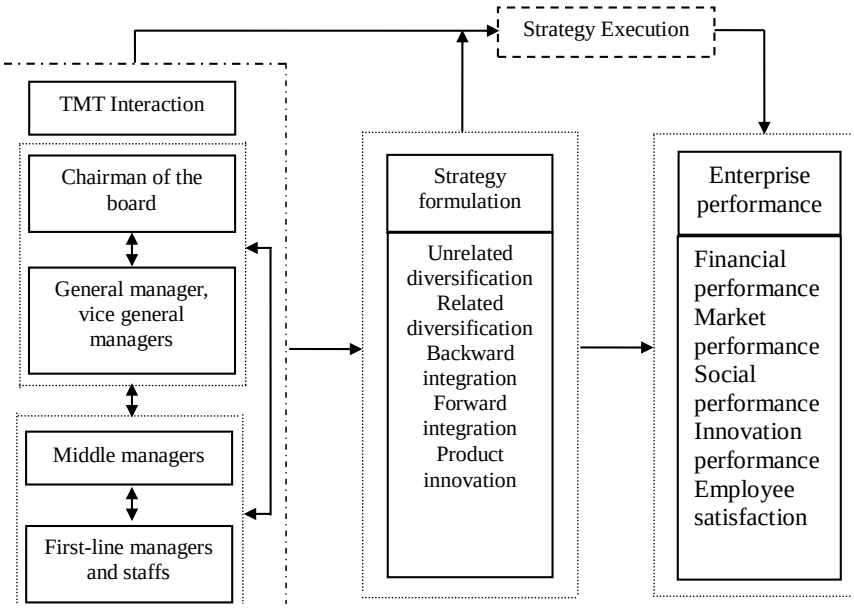


Figure 2. Theoretical framework of the relationship between TMT interaction and enterprise performance.

different cognition, beliefs, values. Only through internal interaction process such as conversation, communication, discussion and even controversy can TMT reach an agreement and make a consensus on the enterprise culture. If TMT members cannot reach an agreement on the enterprise culture, it is very difficult that middle-level managers, first-line managers and employees can make a consensus; much less it can be a source of the enterprise sustained competitive advantage.

Interaction among TMT, middle managers, first-line managers, employees

If enterprise culture, as a kind of soft strength, wants to be the source of the enterprise sustained competitive advantage after reaching a consensus in the TMT, there is also an important condition that all staffs (most) accept, identity and consciously comply with it, that is to say, enterprise culture must fall to the ground. Therefore, TMT should pay attention to interact with middle managers, first-line managers and employees by publicity, conversation, communication, feedback, etc. It is only through interaction can the enterprise culture in an enterprise be internalized in the mind, solidified in the system, and made manifest in the physical and external action. In addition, it is very indispensable for TMT to set an example by their own action as enterprise culture demonstrators. Just as Confucius said in "The Analects of Confucius": "an upright man will be obeyed even if no orders are given; a crooked man will not be obeyed even if orders are given". Only in this way, can the enterprise culture be accepted, identified by employees, and consciously abided by. Finally, it is noteworthy that corporate culture, as a kind of soft power, once be recognized and accepted by everyone, which in turn will help to interact among the members of TMT and to interact among TMT, middle managers, first-line managers, employees. In summary, this paper puts forward the theoretical framework of the relationship between TMT interaction and enterprise culture, as shown in Figure 3.

TMT interaction and enterprise performance from the perspective of enterprise culture

Enterprise performance is the comprehensive reflection on all kinds of business activities (production, marketing, human resource management, finance, research and development, etc.) of the enterprise organization in a certain period of time, which will be affected by many factors such as enterprise resources, enterprise internal and external objective environments, strategy formulation, the implementation of the staffs, and so on. For the purpose of this study, the paper explores the impact of TMT interaction on enterprise performance only from the perspective of corporate culture

Firstly, enterprise culture, as a kind of intangible asset and soft power, can be a source of a driving force and sustained competitive advantage with certain conditions, which can form a soft constraint and then reach the highest realm of management (i.e. to govern by non-interference), once all staffs approve, identify and accept the enterprise culture. Outstanding enterprise culture can

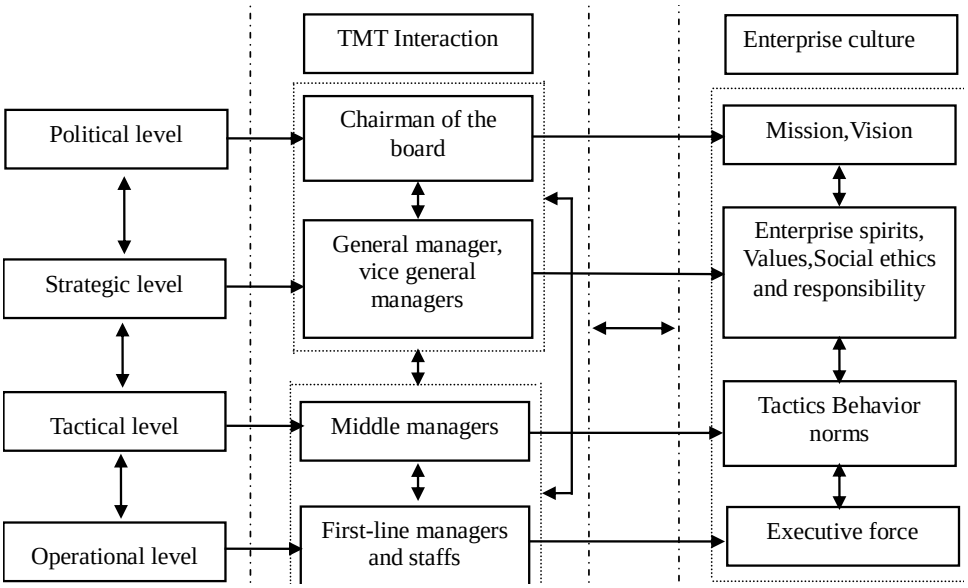


Figure 3. Theoretical framework of the relationship between TMT interaction and enterprise culture.

motivate employees to work hard to realize the enterprise performance goals by affecting the staffs attitude and behavior.

The excellent distinctive enterprise culture also can affect the attitude and behavior of customers and other stakeholders ,which can help to establish a corporate brand image, to enhance corporate popularity and reputation, thus to achieve business all kinds of performance goals. Secondly, because of different values, cognition, etc., TMT internal interaction can help TMT members to make an agreement and consensus. The interaction among TMT, middle managers, first-line managers, staffs can help all staffs to agree, identify accept and abide by the enterprise culture. Excellent corporate culture can create a kind of harmonious, pleasant working atmosphere to promote TMT members to interact and to promote TMT to interact with the subordinates. Both of them combine organically together, which affect the attitude and behavior of employees, customers and other stakeholders and improve the enterprise performance better. In addition, because each person's knowledge, ability and energy are limited, TMT interaction can help to improve the quality of strategy making and effective implementation of strategy, which have an important impact on the enterprise performance. Finally, it is noteworthy that the culture driving force and sustained competitive advantage which enterprise culture has, as well as staffs attitude and behavior can effectively improve strategy execution, and then can improve enterprise performance. In summary, this paper puts forward the theoretical framework of the impact mechanism of TMT interaction on enterprise performance from the perspective of enterprise culture, as shown in Figure 4.

Conclusion

The relationship between enterprise culture and enterprise performance and the relationship between TMT and enterprise performance have been the hot topics which academy and business circles focused on and which also had some research results. However, previous studies on the relationship between enterprise culture and enterprise performance and the relationship between TMT and enterprise performance were carried out according to two parallel lines, with almost no crossover study on them. This paper puts forward the theoretical framework of the impact mechanism of TMT interaction on enterprise performance first time from the perspective of enterprise culture and elaborates it systematically. Enterprise performance is the comprehensive reflection on the enterprise management effectiveness and efficiency in a certain period of time, which will be affected by many factors such as enterprise resources, enterprise internal and external objective environments, strategy formulation, the implementation of staffs, and so on. However, this paper, only from the perspective of enterprise culture, explores the impact of TMT interaction on enterprise performance and proposes four theoretical frameworks. It is expected that, to some extent, this study can provide strong theoretical foundation and stimulus for empirical research into the links among TMT interaction, enterprise culture, enterprise performance in the future.

ACKNOWLEDGMENTS

This paper is supported by National Social Science

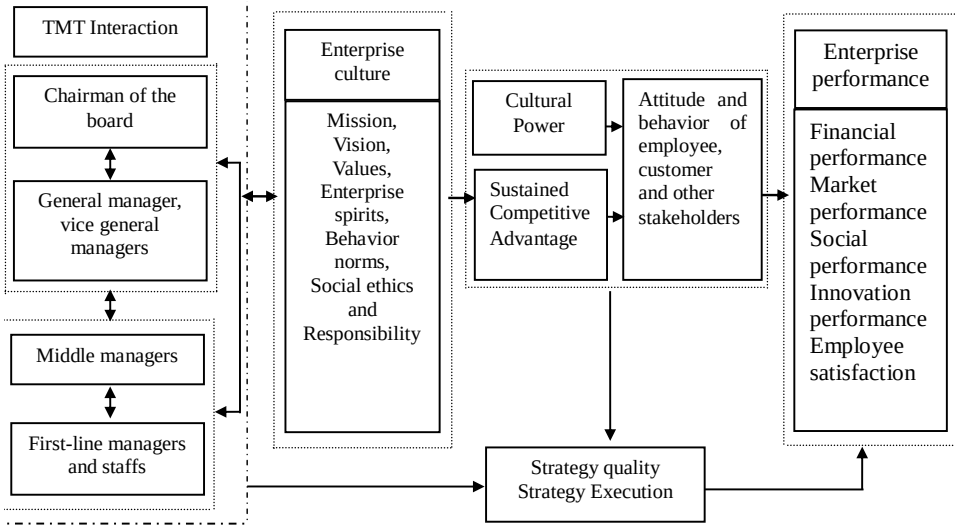


Figure 4. Theoretical framework of the impact mechanism of TMT interaction on enterprise performance from the perspective of enterprise culture.

Project (No. 11BGL013); National Soft Science Research Program Funded Project (2013GXQ4D165); Scientific research key projects (14ZS117) of Shanghai Education Commission; Shanghai First-class Academic Discipline Project (S1201YLXK).

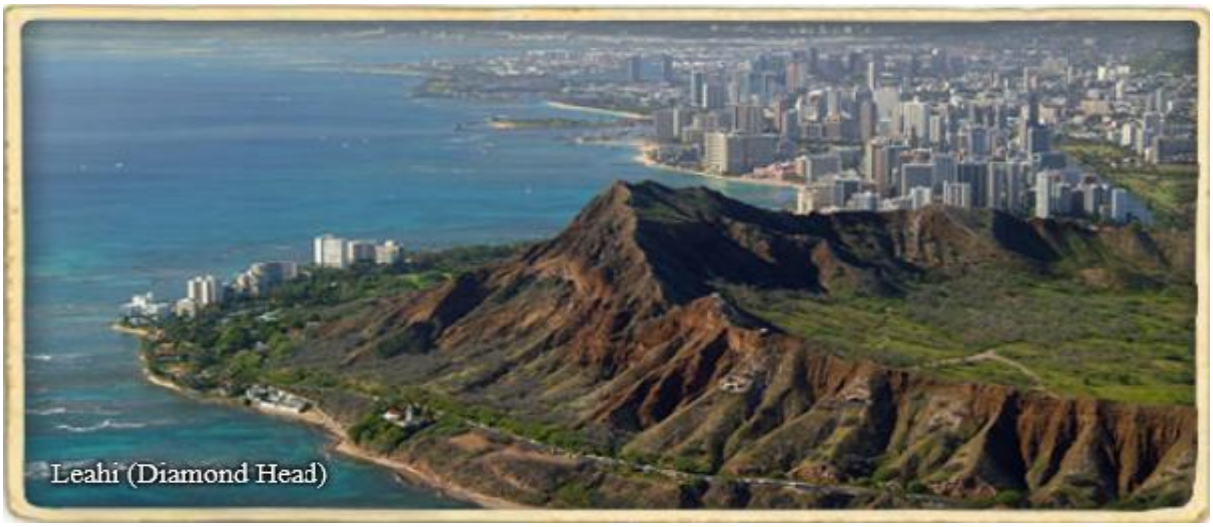
Conflict of Interests

The author(s) have not declared any conflict of interests.

REFERENCES

Alan L Wilkins, William G Ouchi (1983). Exploring the relationship Between Culture and Organizational Performance. Adm. Sci. Q. 28(3):468-481.
Barney J (1991).Firm resource and sustained competitive advantage, J. Manage. 17(1):99-120.
Barney JB (1986). Organizational Culture: Can It Be a Source of Sustained Competitive Advantage?, Acad. Manage. Rev. 11(3): 656-665.
Cameron KS, Freeman SJ (1985). Cultural congruence, strength, and type: relationships to effectiveness, School of Business Administration, University of Michigan.
Cameron C, Tate B, Macnaughton D, Politano C (1998). Recognition without Rewards. Winnipeg, MB: Peguis Publishers.
Carpenter MA, Geletkanycz MA, Sanders WG (2004). Upper echelons research revisited: Antecedents, elements, and consequences of top management team composition, J. Manage. 30:749-778.
Deal TE, Kennedy AA (1982). Corporate cultures: Reading, MA: Addison-Wesley.
Ge YuHui (2011). Study on relationship between TMT human capital and the degree of power distribution differentiation, Enterprise Econ. 10:9-14.
Guangming L (2002). The corporate culture, (3rd ed.). Beijing: Economic Management Press.
Hambrick DC (2007).Upper echelons theory: an update, Academy of Management Review 32(2):334-343.
Hambrick DC, Mason PA (1984). Upper echelons: the organization as a reflection of its top managers, Acad. Manage. Rev. 9(2):193-206.
Hofsted GJ, Neuijen B, Ohayv DD, Sanders G (1990). Measuring Organizational cultures: a qualitative and quantitative study across twenty cases, Administrative Sci. Q. 35(2):286-316.
Pettigrew AM (1979). On Studying Organizational Cultures, Administrative Sci. Q. 24(4): 570-581.
Ruekert RW, Walker Jr. OC, Roering KJ (1985). The Organization of Marketing Activities: A Contingency Theory of Structure and Performance. J. Market. 49:13-25.
Schein EH (1985). Organizational Culture and Leadership, University of Illinois at Urbana-Champaign's Academy for Entrepreneurial Leadership Historical Research Reference in Entrepreneurship.
Schein EH (1983). The role of the founder in creating organizational culture, Organizational Dynamics.12(1):13-28.
Venkatraman N, Ramanujam V (1986). "Measurement of business performance in strategy research: A Comparation of Approaches," Acad. Manage. Rev. 11(4):801-814.
Zammuto RF, Krakower JY (1991). Quantitative and qualitative studies of organizational culture, JAI Press Inc.
Zhang D (2003). "On Man's Mental Quality," Psycho. Behav. 1(2):143-146

2014 Global Hospitality, Tourism Marketing & Management Conference 14th -16th February 2014



International Conference on Producers and Audiences, Lund, Sweden 2014

Conferences and Advert

February 2014

SIBR 2014 Kuala Lumpur Conference on Interdisciplinary Business and Economics Research, Kuala Lumpur, Malaysia

National Conference on Innovations & Advancements in Information Technology, Nerul, India

International Conference on Economics Business and Marketing Management, Hong Kong, China

International Business Research, Economics, Finance and MIS Conference (BREFM), Honolulu, USA

March 2014

Association for Education Finance and Policy 39th Annual Conference, San Antonio, USA

3rd International Conference on Humanity, History and Society (ICHHS 2014), Penang, Malaysia

1st Journal Conference on Innovation, Management and Technology (JCIMT 2014 1st), Macau, China

Conference on Retroviruses and Opportunistic Infections (CROI), Boston, USA

11th International Fatigue Congress, Melbourne, Australia

Annual AIPAC Policy Conference, Washington, USA

African Journal of Business Management

Related Journals Published by Academic Journals

- Journal of Geography and Regional Planning
- Journal of Economics and International Finance
- Journal of Hospitality Management and Tourism
- International Journal of Sociology and Anthropology
- Journal of Public Administration and Policy Research
- African Journal of Marketing Management

academicJournals