International Journal of Applied Information Systems (IJAIS) – ISSN : 2249-0868
Foundation of Computer Science FCS, New York, USA
Volume 7– No.10, October 2014 – www.ijais.org

Value Propositions Matrix of ERP Technologies: The Transition from Transactional to Value Creation Engine

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ABSTRACT
This paper aims to shed light on how the use of ERP technologies can create value and strategic advantages. One of the most popular questions about use of ERP technologies whether it is operational or unique value driver? The relevance of this question is grounded in the increasing strategic uses of ERP technologies. The unique contribution of the current paper emphasis value propositions of ERP technologies. Prior researches have long been interested in investigating the operational contributions of ERP technologies. The paper move away from the operational contributions towards a more organic approach. A dynamic matrix with key value creation parameters has been established. This empirical paper is based on a survey carried out among small and medium sized companies to ascertain the extent to which ERP technologies can be used as strategic and value creation tool. According to analysis of this paper, value creation contribution of ERP technologies varied according to IT infrastructure, information resources available, and organizational culture. The results introduce clear understanding for superiority and significant value creation contributions of ERP technologies. The results found that optimization of cost structure is still the most superior contribution and may improve value creation of ERP technologies in different ways. Such results are expected to assist companies to better analyze and adapt ERP scenarios to leverage its value and returns.

Keywords
ERP, BVIT, Value Proposition, Cost Structure, Product Quality, Revenue Growth, Customer Satisfaction.

1. INTRODUCTION
Developments in ICT technologies have been paramount in recent decades supporting far reaching scenarios within and between organizations. ERP technologies have increasingly become a major source of productivity, profitability, and competitiveness. The dynamic cycle of change works when a new set of ERP technologies designed and installed. With a new ERP technologies, the companies now have the opportunity to define new processes and applications supported by different business rules. The transformation of ERP technologies have resulted in tremendous business value that related to maximize return on income and minimize total cost of ownership [13]. Use of ERP technologies to create value is a new paradigm in business. Furthermore, investigating the way about how to create value has become critical success issue in the business. The success of ERP technologies transformation depends on several key components including innovative uses and regular review of infrastructure to keep it aligned with changing business needs [10]. The problem of present business literature is that pay more attention to use of ERP technologies not the way of how such technologies can be used to create value [8]. The business specialists still believe that once the right ERP technologies is put in place, appropriate value creation will follow. For example, the primary reason for ERP technologies' failure is that very few companies have been used such technologies with value creation concern. Transforming ERP technologies from being a business problem to an opportunity entails real consideration for multiple barriers such as IT management, the cultural gap between business and IT specialists, the rapid pace of technological change, and the immense and difficulties associated with integrating components of ERP technologies into a company platform [17]. The value creation process requires a completely different set of understanding, architecture, and technologies.

In the context of IT application, the key purpose of this paper is to delineate the value creation impact of ERP technologies. This paper is providing an agenda of understanding a new role of these technologies. As such technologies have become a fundamental catalyst of operations and one of the most dominated information technology applications. The aim of the present paper is to show the value creation impact of ERP technologies and to make a critical analysis of each dimension of such impact. The paper falls in the area of IT applications. The paper begins by briefly reviewing the literature on business value of information technology and ERP technologies as an urgent tool of business practices and applications. Also, an explanation of the adopted methodology is provided. Lastly, the research paper concludes with a discussion of the results and directions for future research.

2. LITERATURE REVIEW & THEORETICAL FRAMEWORK
ERP is a generic term for an integrated enterprise wide computing systems that encompasses the technologies and techniques for the integrated management of business processes. ERP technologies are software architecture and information systems that facilitate integration and flow of information among business process with the aim of reducing cost and creating value by making the right information. According to Moon [15], ERP technologies offer the opportunity for companies to incorporate and re-engineer activities with resources and revamp both their information systems and applications. Transforming the technical ERP

platform provides the opportunity to create more agility, cost efficient, and high velocity business processes. However, Development of sophisticated ERP technologies has led to what can be called hybridisation of business processes [2]. As an engine for value chain, the dynamics of hybrid ERP is enabling cross-organizational business processes through providing information engine that is isomorphic to the business process of the entire organization [21].

However, this information engine provides a logical transmission, sharing of common data, and cross-functional integration of business processes. The paradox with ERP is that such technologies have streamlined, flatter, and flexible business processes versus centralization of control over information and the standardization of these processes [3].

This paradox makes business literature ask how ERP technologies will affect performance of companies [4] [16]. According to Jutras [9], the three pressures of ERP technologies: cost reduction, customer service, and growth declines slightly as a driver while the need for interoperability across value chain increases. On the other hand, complexity constitutes the heart problem of ERP technologies .

Such problem result in making business process difficult to be changed, extracted, and correlated. According to Kimberling, the problem isn't in the software. It's in the way companies implemented the software and get their organizations to adapt to it. The lack of alignment between the organization strategy, structure, processes, and ERP technologies is one of key risk that clearly identified in the business applications [18]. Mani et. al [13] concluded that limited research has been considered to provide a better understanding of the factors that explain success of ERP.

In terms of research, Eckartz, et al. [6] have identified three research gaps related to ERP technologies. First is the current literature does not provide a complete view on identifying, realizing, and assessing ERP technologies benefits [5]. Further, there are huge differences in the amount and level of these technologies benefits provided by the authors [18]. Second, there is real lack for research focused on cross-organizational ERP technologies implementations. Third, there is a lack of guidelines that can be used to identify, realize, and assess ERP technologies benefits. The value proposition for investing in ERP technologies has traditionally been tied to the standardization of business processes and centralization of information policy [20].

Increasing business value is a new methodology of ERP technologies [14]. The genesis of business value of ERP technologies back to 1970s and it was built on the value proposition of efficiency of business processes via automation [12]. Value creation is the result when the architecture of ERP technologies is fully integrated or aligned with business applications [7].

The concept of business value of ERP technologies was originated in the business literature to refer to design and use of these technologies to gain financial values especially earning power and organizational success. These improvements include productivity enhancement, profitability improvement, cost reduction, competitive advantage creation, inventory reduction, and other measures of performance such as maximization of return on investment and minimization of total cost of ownership [9]. It is increasingly realized that in future only those companies, which have developed highly sophisticated ERP software, will be able to retain their market share and achieve profit and growth. According to Rajapaksha et al. [16], the global organizations have unique information requirements and ERP can support their information requirements. Further, co-aligning global business information requirements with ERP has positive impact on financial, customer, learning and growth, and internal business processes performance moderated by organization size and business history. Kohli and Devaraj[11] found that improvements in profitability can be source to improve organizational profits and shareholders' value. Increasing return on investments and sales associated with reduction in cost both are drivers for improvements in profit and shareholders' value. Tallon and Pinsonneault [22], measured the improvements in profitability and business growth as a result for efficient alignment of ERP with business processes. Bostan and Grosu [1] concluded that enhancing customer's services by use of ERP can increase customer satisfaction and organizational success. Customer satisfaction is an important element in achieving organizational success. However, Spraakman [19] ascertained that improvement in quality, productivity, efficiency, and effectiveness are outcomes of organizational internal business process improvement.

Analyzing ERP technologies role in companies' growth reveals that these technologies have dominated value creation of customer base as the focus has shifted from intra to inter ERP. According to Weill [24], ERP technologies asset has four classes: 1. Infrastructure: provides the foundation of shared IT service both human and technical used by multiple applications such as servers, networks, laptops, and shared customer databases. 2. Transactional: automates processes, cuts costs or increases the volume of business. 3. Informational: provides information for managing, accounting, reporting, and communication internally and with customers, suppliers, and regulators. 4. Strategic: supports entry into a new market, development of a new product or capabilities. The value creation of ERP technologies is a collaborative methodology which taking the advantages of all above classes. According to Tenkorang and Helo [23], creating business value by use of ERP technologies usually happened through practicing cost effective maintenance, restrict customization, and easily take the advantage of supplier provided improvements. In comparison to the initial business value models, a number of practical principles for managing the value of ERP technologies are emerging. These principles are based on an idea that managing the economics of these technologies has to absorb three principles: managing costs, managing value, and managing risk related to business goals and imperatives.

In terms of such debate, business value of ERP technologies has centred on two questions: the first question of debate has concerned the operational value of ERP technologies that related to the organizational efficiencies and effectiveness. The second question concerns on how ERP technologies will be used to generate the strategic competitive advantages. The differentiation between the transactional and transformational aspects still is unclear. The issue of value creation impacts of ERP technologies is full of controversy associated with how such impact will be created? The contribution of the current paper is coming from drawing the milestone of transformational ERP typology as shown in Figure 1. We ask that authors follow some simple guidelines. In essence, we ask you to make your paper look exactly like this document. The easiest way to do this is simply to download the template, and replace the content with your own material.

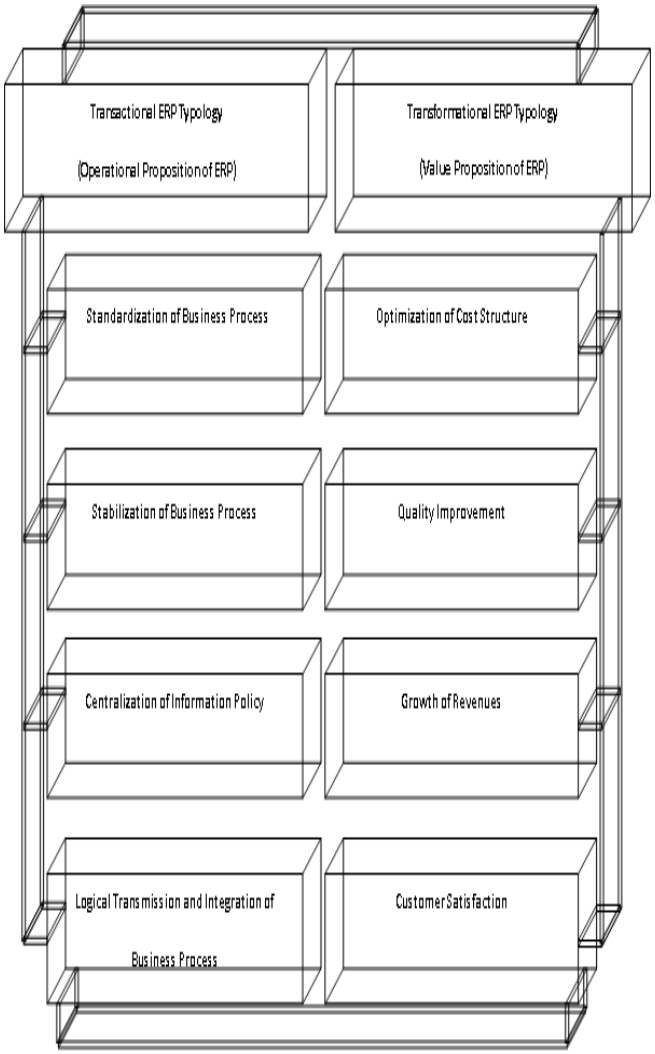

Figure 1 Transactional Vs. Transformational ERP Topology

3. AGENDA, SURVEY, AND TECHNIQUES:

3.1 Agenda

The value proposition for investing in ERP technologies has traditionally been tied to the standardization of business processes and centralization of information [3]. The differentiation between the transactional and transformational aspects still is unclear. The issue of value creation impact of ERP technologies is full of controversy associated with how such impact will be created and dimensions related to such impact. Agenda of the present paper provides small investigation in this direction and suggests several contributions to the ERP literature. According to this paper, matrix of value proposition of ERP technologies has been built based on four strategic parameters: optimization of cost structure, improvement of quality, growth of revenues, and satisfaction of customers. The extraneous variables of cost, quality, revenues, and customer satisfaction were controlled by randomization and elimination. The sampled companies selected based on two main criteria. These criteria were style of ERP technologies and type of business process automation.

The sample included sixteen manufacturing companies listed in Amman Exchange Market AEM (See Table 1). A structured questionnaire consisting of closed ended questions was developed. A 19-question was developed based on review of literature. Questions on the perceived impacts-give a statement and ask for the level of impact on scale ranging from 7 (large) reduction, improvement, growth, and satisfaction to 1 (small) reduction, improvement, growth, and satisfaction. The questionnaire consisted of five groups. Each domain consisted of 19 questions. The first group designed to gather information on demographic profile of the respondents. The other groups from the second to fifth structured according to four value parameters explored in review of literature: cost reduction and optimization, quality improvement, revenues growth, and customer satisfaction (independent variables). To refine and validate questions asked and prior to managing the survey, the first version of the questionnaire was validated through expert interviews and a panel of academics and practitioners. Further, the first version was tested using results from three respondents. According to feedback from the pilot test, the final draft of the questionnaire revised by removing those questions with low reliability and modifying those lacking semantic clarity.

3.2 Survey

The methodology applied in this paper is based on cross-sectional and quantitative research design to address the formulated parameters. A total of sixteen questionnaires were distributed to the targeted sampled companies. Questionnaires given to staff members who were in charge of finance and technology functions. The qualitative data were gathered through in-depth individual interviews and focus groups. Interviews were carefully managed with financial managers of the sampled companies. For the purpose of this research, financial managers of sampled companies were targeted to respond to the questionnaire survey. Respondents were asked to subjectively indicate the degree to which the ERP technologies within their companies had driven the value proposition parameters proposed in the agenda of this paper.

3.3 Data Analysis Technique

To analyze the qualitative and quantitative surveyed data, related statistical methods were utilized. First, data were checked, recorded, cleaned, and aggregated to a firm level. Completed questionnaires were further checked for missing values and inconsistencies in response given by the respondents. Qualitative analysis was done were appropriate. The questions in the questionnaire were analyzed in tabular form using simple percentage, mean values, standard deviation, and t-test. These statistical techniques are used to investigate the parameters and to establish if there is a value creation impact for ERP technologies. The percentage enabled the researchers to simplify the calculation of the impact by using the formula [(X/7) multiplied by 100] where X represents mean of respondents rating of impact being assessed. Response to rating scale questions were tested for significance using the t-test. Microsoft Excel spreadsheets used to prepare the computation. Subsequently, computed value of (t) were compared with the respective tabulated values at a = 0.05 (i.e. level of significance) and degree of freedom (n-8) = 92.

Table 1. Survey Profile

Surveyed Industries (No. of Companies)	ERP	Automation
Food (6)	O&S	P
Paper (3)	O&S	F
Pharmaceutical (2)	O	F
Electrical (1)	O	F
Chemical (2)	O&S	P&F
Petroleum (1)	O	F
Tobacco (1)	O	F
Total	(**O**=Oracle) (**S**=SQL) (**P**= Partial) (**F**=Full)	

4. ANALYSIS & DISCUSSION

4.1 Overall Impact

To verify assertions of this paper, several indexes were created by aggregating and averaging actual responses on parameters derived from the extant literature. T-test were conducted to analyze the overall impact while mean, standard deviation, and percentage of impact to analyze the detailed impact. The results of the questionnaire responses are shown in Table 2. The respondents are generally in agreement that ERP technologies have value creation impact. The mean score of all parameters were above 3 and standard deviations do not deviate significantly from the means. The results show that high t-value where equal to ($t=5.275$, $p<0.05$) and the minimum t-value being equal to ($t=2.087$, $p>0.05$).The following are the detailed examinations for each parameter.

4.1.1 Optimization of Cost Structure

The results reported in Table 2 reveal that mean for this parameter was equal to (5.04). However, the statistically significant calculated t-value (5.275) compared with tabulated t-value (3) indicates that the respondents agree that highest value creation impact generated by reducing cost. Further analysis of the statistical significance indicates that level of cost reduction tends to vary across business processes of sampled companies (Table 3). High mean of cost reduction scored in process of cost control (6.33) compared with lowest mean of (4.00) across bookkeeping process. The percentage of such impact was equal to (90.4) with variance of (.707). The percentage of detailed impacts associated with variance for other business processes are shown in on Table 3. This high score of results can be attributed to creation of invisible flow of information instead of the costly physical flows. One interesting finding is the large contribution of cost reduction through most of business processes because of automation of these processes whether fully or partially.

4.1.2 Quality Improvement

Analysis of results shown that the respondents ranking quality improvements as part of value creation impact of ERP technologies with mean equal to (4.79). Testing t-value indicates that calculated t was equal to (4.683) comparing with tabulated t of 3. Examining the perceived impact of quality improvements associated with business processes shown that quality control have more improved as a result of using of ERP technologies with mean equal to (6.50). The percentage of such impact approximated (92.9) associated with variance equal to (1.069). Table 4 presents findings associated with quality improvements of other business processes. The least quality improvement was cited by (61.9%) on bookkeeping processes. This result is probably explained by the way processes of quality control are done. Standardization of quality control processes has streamlined and accelerated those processes and then easing its automation and integration. Automation of business processes as a result of use of ERP technologies have generated value creation impact through what can be called completeness and new nature processes of quality control.

4.1.3 Growth of Revenues

The results of the questionnaire responses demonstrated that the present scenario of ERP technologies has not that much impacted growth of revenues (See Table-2). The impact of these technologies has been modest and most likely preliminary. Thus, mean of the survey response related to this parameter was equal to (4.28). The low impact is also evident in testing t-value as the calculated cited by (2.087) which is lower than the tabulated that was equal to (3). Examination of the statistical data shows that the variance rates associated with this parameter were higher than other (See Table 5). However findings in Table 5 indicated that sales management processes had the biggest value creation impact in relate to growth of revenues (73%) with variance equal to (2.088). In contrast, bookkeeping is the least business process affected by use of ERP technologies in terms of maximizing revenues with mean equal to (3.78) associated with variance equal to (2.279) and total percentage of impact of (54.00). There is however a high degree of consensus among respondents that creative uses of ERP technologies to maximize revenues in surveyed companies still needed.

4.1.4 Satisfaction of Customers

Results in Table 6 have indicated high and significant impact exists between use of ERP technologies and satisfaction of customers. The results of the survey shows mean equal to (4.79) and spectrum of impacts ranged from (61.9) to (92.9) (See Table 6). The parameter had statistically significant t value with calculated t equal to (4.719) compared with tabulated t equal to (3). This result indicates that use of ERP technologies has value creation impact that related to customer base and satisfaction. However, the organizational impacts associated with this parameter has shown that improvement in quality control systems generated customer satisfaction with mean (6.50) and total impact equal to (92.9) associated with variance equal to (1.069). The lowest impact that related to customer satisfaction was cited by bookkeeping process with mean equal to (4.33) and total impact equal to (61.9) associated with variance equal to (2.121). Respondents have viewed automation of sale tasks associated with killing time and cost as a driver beyond such rate of customer satisfaction. Looking closely at surveyed ERP technologies provides a clear picture that it has a lot of potential especially in the area of customer management and sales orders. Table 6 details scores of ERP technologies impact on customer satisfaction.

4.2 Subsidiary Impacts

The statistical analysis of the proposed parameters indicated that the value creation impact of ERP technologies tends to vary across sampled companies and business processes. The extent to which the ERP technologies had driven business processes can be ascertained by referring to Table 3, Table 4, Table 5, and Table 6. As highlighted in Table 3, for a given

standard deviation, the highest value creation impact on cost structure scored in costing control process. An examination of such result clearly illustrates that ERP technologies have automated much of costing control process comparing to the other business processes. While the lowest cost impact of ERP technologies scored on bookkeeping processes. This level of impact supports the idea that surveyed companies lack the creative use of ERP technologies (See Table 3). The inspection of ERP technologies impact on quality improvement showed high level of impact on quality control systems comparing to the low impact on bookkeeping processes (See Table 4). The possible explanation for this phenomenon is that ERP technologies have completely changed the way processes of quality control are done. Standardization of quality control processes has streamlined and accelerated those processes and then easing the automation and integration. The automated business processes (or hybrid business processes) by ERP technologies have generated what can be called "completeness" and "new nature" of quality control of business processes [2]. As for growth of revenues parameter, the details of Table 5 present a low spectrum of impacts ranged from 54.0 to 73.0 (See Table 5). This result provides unclear picture concerning superiority of ERP technologies. The ranking impact developed in this paper identifies lack of creative business applications out of automation and integration. Considering the control aspects has dominated use of ERP technologies in surveyed companies. On the other hand and according to the interviews, most of the surveyed managers have ascertained that financial policy received less attention and designed totally different compared to IT policy. Finally, Table 6 summarizes the ERP technologies impact on customer satisfaction parameter. High impact scored on customer order and sales management systems respectively (84.1 and 82.6). Automation of sale tasks associated with killing time and cost is the driver beyond such level of customer satisfaction. Looking closely at surveyed ERP technologies provides a clear picture that it has a lot of potential especially in the area of customer management and sales orders. According to these findings, it could be said that ERP technologies have strategic impact related to value creation. Despite the fact that such impact still unclear and restricted by so many variables related to IT architecture, policy, and culture. As part of underdeveloped countries, the biggest challenge is still how to adapt ERP technologies for more strategic and value creation goals.

Table 2. Mean scores and one sample t-test statistics

Parameters	**Mean**	**CT**	**TT**	***df***	***Sig.***	***Dif.***
Optimization of Cost Structure	5.04	5.275	3	8	.001	2.1433
Quality Improvement	4.79	4.683	3	8	.002	2.0744
Growth of Revenues	4.28	2.087	3	8	.070	1.2840
Customers Satisfaction	4.79	4.719	3	8	.002	1.7919

Table 3. Optimization of Cost Structure

Business Process	**Mean**	**SD**	**Impact (%)**
Costing Control	6.33	.707	90.4
Production Control	6.00	1.118	85.7
Sales Management	5.44	1.236	77.7
Inventory Management	5.33	1.936	76.1
Quality Control	5.11	1.833	73.0
Customer Order Management	4.78	1.716	68.3
Production Follow Up	4.75	2.121	67.9
Project Management	4.67	1.581	66.7
Bookkeeping Process	4.00	2.121	57.1
Average of Overall Impact	**5.156**		**73.65%**

Table 4. Quality Improvement

Business Process	**Mean**	**SD**	**Impact (%)**
Costing Control	4.44	2.297	63.4
Production Control	4.56	1.236	65.1
Sales Management	5.78	2.108	82.6
Inventory Management	4.44	2.297	63.4
Quality Control	6.50	1.069	92.9
Customers Order Management	5.89	1.965	84.1
Production Follow Up	5.22	1.986	74.6
Project Management	4.89	2.088	69.9
Bookkeeping Process	4.33	2.121	61.9
Average of Overall Impact	**5.11**		**73.1%**

Table 5. Growth of Revenues

Business Process	**Mean**	**SD**	**Impact (%)**
Costing Control	4.44	2.351	63.4
Production Control	4.44	2.128	63.4
Sales Management	5.11	2.088	73.0
Inventory Management	4.78	2.279	68.3
Quality Control	4.78	2.333	68.3
Customer Order Management	4.67	1.936	66.7
Production Follow Up	4.50	2.268	64.3
Project Management	4.13	2.232	59.0
Bookkeeping Process	3.78	2.279	54.0
Average of Overall Impact	**4.51**		**64.48%**

Table 6. Customer Satisfaction

Business Process	Mean	SD	Impact (%)
Costing Control	5.00	2.398	71.4
Production Control	4.44	2.297	63.4
Sales Management	5.78	2.108	82.6
Inventory Management	4.44	1.810	63.4
Quality Control	6.50	1.069	92.9
Customer Order Management	5.89	1.965	84.1
Production Follow Up	5.22	1.986	74.6
Project Management	4.89	2.088	69.9
Bookkeeping Process	4.33	2.121	61.9
Average of Overall Impact	**5.16**		**73.8%**

5. CONCLUSION

This paper suggests a strategic matrix for value creation proposition of ERP technologies. The proposed matrix consists of four parameters: optimization of cost structure, quality improvement, growth of revenues, and customer satisfaction. The current paper has introduced clear understanding for superiority and significant value creation impacts of these technologies. One of the possible reasons for the varied results of this paper is the methodology used for measuring value creation impacts. This paper contributes to ERP literature and has many practical implications. First, among four key parameters tested in this paper, three were accepted and the picture about the fourth parameter is still unclear. Second, this study discovered and explored ERP impact regarding business processes which was varied across these processes in terms of rate and applications. Third, the results of this paper are in support of findings of other ERP technologies researches. Fourth, the ranking impact developed in this paper identifies lack of creative business applications out of automation and integration. Fifth, innovative and value creation uses for ERP technologies entails realistic adaptation for these technologies to match business needs. For future researches, additional data are needed to assess the innovative use of ERP technologies. Data needed are related to type of IT infrastructure, resources, and culture. Furthermore, the organizational policy whether behavioral procedural or political has to be investigated in view of IT infrastructure adopted. The findings of this paper should be viewed in light of a few limitations. Number of surveyed companies, style of IT infrastructure adopted by these companies, and uses of ERP technologies must be noted.

6. ACKNOWLEDGEMENT

The author would like to express grateful thanks the anonymous reviewers for their encouraging and constructive comments.

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