

A maturity model for SCPMS project: an empirical investigation in large sized Moroccan companies

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Abstract

In the recent years many studies on maturity model have been carried out. Some refer specifically to maturity models for supply chain and performance measurement system.

Starting from an analysis of the existing literature, the aim of this paper is to develop a maturity model for the supply chain performance measurement system (SCPMS) project based on the concept of critical success factors (CSFs). This model will be validated by two approaches. The first is a pilot test of the model in a Moroccan supply chain to demonstrate his capacity of assessing the maturity of SCPMS project and whether it can develop an improvement roadmap. The second is an empirical investigation in large sized Moroccan companies by using a survey to depict whether it can evaluate the maturity of SCPMS project in different industries.

Keywords: *Maturity model, Project management, Supply chain performance, measurement system.*

1. Introduction

Today's manufacturing competition goes beyond single companies and becomes a battle fought between supplies chains. To deal with the complexity of the current industrial context, new strategies has gained wide acceptance when driving continuous improvement. Generally, these strategies include the following steps: identifying key areas, as-is situation analysis, planning and implementing changes, monitoring the results, and developing a closed-loop control system [1]. To acquire a decent functioning of the previous steps we need to enhance the quality of SCPMS.

Indeed, the project of developing and implementing SCPMS has become one of the critical issue for gaining competitive advantages for companies and replying to ever increasing market pressure. Although many studies on that issue have been carried out in the last few years, Olugu and Wong support the idea that there is still a gap in knowledge in the area of supply chain performance measurement [2]. Several studies have revealed that there are many obstacles and barriers for supply chain performance management [3,4]. While others propose that reviewing and improving SCPMS should be a continuous process [5,6].

There are many models of maturity project such as Capability Maturity Model Integration [7], Project Management Maturity Model [8], Organizational Project Management Maturity model [9], and others that are available for companies to improve their Projects Management. However, none of these models of maturity address the project of designing and implementing SCPMS specifically. Also, there are few studies on the maturity model in performance measurement system [10,11], and supply chain [12,13].

In this paper, we will describe a maturity model for the project of designing and implementing SCPMS. In order to develop this maturity model, we will use the concept of critical success factors (CSFs) [14] and we will try to validate it through a pilot test and empirical investigation in large sized Moroccan companies.

2. The project of developing and implementing SCPM

Efficient supply chain management has consequently become a potentially valuable method of securing a competitive advantage and improving firm's performance [15]. The supply chains tend to make greater use of balanced and integrated performance measurement systems, and, in turn, they will be able to perform at a higher level. Developing a SCPMS is a critical task for a supply chain and its members in order to examine their current status and identify improvement opportunities for steering their future direction.

SCPMS describes the feedback on operations which are geared towards customer satisfaction and

strategic decisions and objectives [16]. Berrah and Vincent define a SCPMS as a multi criteria instrument, made of a set of performance metrics, to be consistently organized with respect to the objectives of the company [1]. A SCPMS may include many management processes, such as identifying measures, defining targets, planning, communication, monitoring, reporting and feedback [6]. Balanced and multidimensional frameworks and methodologies have therefore been proposed to support SCPMS, such as the SCOR [17], the balanced scorecard [16] and ABC [18].

After a literature review we recommend following steps for a project of designing and implementing SCPMS:

- Project initiation;
- Human resources preparation;
- Choice of SCPMS framework and defining indicators;
- Launch SCPMS;
- Improve SCPMS.

The difficulties of designing and implementing SCPMS have been widely cited in literature [3,19,20]. The researches on the critical factors for initial and ongoing SCPMS project design and implementation success are rare. At the same time a lot of project management researchers have been trying to discover which factors lead to project success [21]. However, none of these studies specifically address SCPMS project.

Through a comprehensive review of literature, we can summarize critical success factors for each project life cycle stage of designing and implementing SCPMS in Table 1.

Table 1: the critical success factors for a project of designing and implementing SCPMS

Project life cycle	***Critical success factors***	***Authors***
Project initiation	A steering committee should be appointed to the SCPMS project containing the various stakeholders and functions of the supply chain, known for its expertise, and supervised by an external expert in the field of the SCPMS.	[22]
	All the SCPMS project's motivations must be chosen (Strategic Alignment, Continuous Improvement, Management Control, Decision Support, Communication Support, Risk management)	[16,17,23, 24]
	A business process management (BPM) for supply chain must precedes the project of designing and implementing SCPMS	[25]
	The benefits of the project of designing and implementing SCPMS must clearly exceed the yield	[26]
Human resources preparation	Top management support and commitment must be clear	[10]
	A supply chain culture with a trusting environment is needed for a decent success of SCPMS project	[26,27,28]
	Good awareness programs for all stakeholders about SCPMS project is a very significant key of success	[3]
	It is essential to provide a necessary, appropriate training to all stakeholders in every stage of the SCPMS project	[29, 30]
	The participatory style must be used in SCPMS project in order to motivate human resources adhering the project and reduce resistance.	[31,32]
Choice of SCPMS framework and defining indicators	Launch a general audit of the existing SCPMS and determine the degree of his formality and his appropriation by users	[33,34]
	Choose a suitable framework of SCPMS with balanced perspectives (Finance, Customer, employer, supplier, internal process, Learning and development environment/community)	[35]
	Choose a limited number of performance indicators for SCPMS that reflect a balance between financial and non-financial measures related to strategic, tactical and operational levels of decision making and control.	[36]
	Define the settings of indicators: Data source, Formula, Targets setting, frequency, Responsibility, Suitable aggregation, Cost, Performance drivers, Suitable resources for actions should be taken, Cause and effect, and finally Security system.	[1,16,37,38]
Launch SCPMS	Automate collecting of a suitable data and store it with existing information system	[10,19]
	The reporting of SCPMS should be integrated with the existing information system, disseminates understandable information and give great attention to the reports format (Graphs should be the primary method of reporting performance data)	[10,16,39]
Improving SCPMS	Ensuring acceptance of the indicators and achieve a consensus about SCPMS with all Stakeholders	[26]
	Improve features of the SCM software system, including the system functionality, flexibility, integration, reliability, user friendliness, and security.	[40]
	Use the Business intelligence and the visual management system as a platform to communicate SCPMS reports	[41,42]
	Link individual rewards and recognition process with the SCPMS	[16]

3. The maturity model for designing and implementing SCPMS

The concept of the process maturity was born in the Total Quality Management movement and it was widely adopted in ‘‘Capability Maturity Model’’ for software organizations. Then this concept migrated to organizational process and project management [43].

The project management maturity models provide means of identifying some crucial steps to be taken, the tasks that are necessary to accomplish and the sequence of events needed to realize significant and quantifiable results [44].

The Maturity Model for Performance Measurement Systems implies that a PMS are evolving or can be transformed from one level to the next [11]. The most important forces that initiate and accelerate evolution of the PMS are the following [11]: Rivalry among competitors; Information needed from managers; Company-external requirements and IT capabilities.

(Najmi et al.) suggested that the PMS should be dynamic and has to be reviewed and updated frequently (Ongoing, periodic, overall) [5]. The ability of keeping the PMS continuously updated is a challenge for every SC, which need to be extremely flexible and reactive to market changes. Really a project of designing, implementing, using and continuously updating performance measurement systems must be Launch incessantly in the SC. Hence there is a need for a model that assesses the maturity of this type of project.

On the basis of empirical data and an analysis of previous maturity models, Wettstein and Kueng developed a PMS maturity model for assessing existing PMS in firms [11]. They describe the development of a PMS over time, following an evolutionary pattern through four maturity levels (Ad-hoc, Adolescent, Grown-up and Mature). This model is characterized by the progressive development along six dimensions (Scope of Measurement, Data Collection, Storage of Data, Communication of Performance Results, Use of Performance Measures, and Quality of Performance Measurement Processes).

(Najmi et al.) developed a framework for PMS in terms of strategic relevance of measures as well as efficiency and effectiveness by using different tools (EFQM self-assessment process, affinity diagram, prioritization grid) and identifying tree review stages (ongoing, periodic, overall) [5].

Cocca and Alberti concluded that the maturity grids seem to be the most suitable approach to develop an effective tool for a PMS assessment in SMEs [10]. Based in performance best practices and other PMS maturity model, they developed a PMS self-assessment tool for SMEs that consists of some scorecards series. Each scorecard contains three areas which describe three stages of development of practice with consideration following an evolutionary path: level 1 is elementary practice while level 3 corresponds to a good practice [10].

Reyes and Giachetti proposed a three dimensions supply chain maturity model [13]:

- The supply chain views (Supply Chain Management & Logistics, Production System, Inventory Management, Customer Relationship Management, Human Resources Management, Information System & Technology management and Performance Measurement System);
- The abstraction levels (Strategic, Tactical and operational);
- The life-cycle maturity levels (Undefined, Defined, Manageable, Collaborative and Leading).

For each maturity level, the model defines key improvement factors and appropriate tools that a firm can use to move up to the next higher maturity level. So once an enterprise determines its maturity level, it can define an improvement roadmap using key improvement factors and appropriate tools. The model assessment methodology starts with completing a questionnaire which helps managers to determine company’s maturity level for each view. The possible answer for each question is “yes” or “no” and the enterprise should document the evidence that supports the affirmative answer.

The structure of our maturity model is built upon the following three dimensions:

- Maturity level dimension (Ad-hoc, Adolescent, Grown-up and Mature);
- Life cycle stages of project of designing and implementing SCPMS;
- The critical success factors (CSFs) for a project of designing and implementing SCPMS.

The model incorporates some success’s critical factors that have been identified in the previous sections and some elements from other maturity models [10,11,13]. We describe the maturity model for a project of designing and implementing SCPMS in table 2.

Within a stage of SCPMS project life cycle, for each critical success factors the maturity level is assessed. The enterprise should document the evidence that supports the maturity level for each critical success factors. The level of maturity stage of SCPMS project life cycle is the minimum of all critical success factors maturity level. The SCPMS project‘s maturity level is the minimum of all stages maturity level.

The suggested Maturity Model makes it possible for a firm to see where it stands and how it can improve its SCPMS. Thus, it provides a methodology for a company to develop an improvement roadmap to his SCPMS project. When the SCPMS project reaches a specified maturity level in a CSF, the improvement roadmap includes the next level. If level 4 is reached, the company must keep it.

Table 2: Maturity model for a project of designing and implementing SCPMS

SCPMS Project life cycle	CSFs of SCPMS project	Maturity Level 1 ad-hoc	Maturity Level 2 Adolescent	Maturity Level 3 grown-up	Maturity Level 4 mature
Project initiation	The Steering committee	No project steering committee	A steering committee was appointed to the project but with little involvement of stakeholders and functions of the supply chain	A steering committee was appointed to the project but with a wide participation of stakeholders and functions of the supply chain	A steering committee was appointed to the SCPMS project containing the various stakeholders and functions of the supply chain, known for its expertise, supervised by an external expert in the field of the SCPMS.
	The motivations of the project	The motivations of the project are not specified	Some motivations of the project are design ated	Most of the motivations of the project are designated	All the SCPMS project's motivations must be chosen (Strategic Alignment, Continuous Improvement, Risk Management, Management Control, Decision Support, Communication Support)
	BPM of supply chain	No BPM of supply chain before the SCPM S project	A partial BPM of supply chain precedes the SCPMS project	A BPM of the most activities in supply chain precedes the SCPMS project	A global BPM of supply chain precedes the SCPMS project
	Cost of SCPMS project	No studies on the cost of the SCPMS project	A preliminary study on the cost of the SCPMS project is done	More studies on the cost of the SCPMS project are done	A global study on the cost and the economic efficiency of the SCPMS project is done
Human resources Preparation	Project management Style	No specified style management for SCPMS project	A coercive style management is adopted for SCPMS project	A directing style management is used in SCPMS project	A participatory style is used in SCPMS project
	Organization al culture and trusting environment	A suspicious environment and individual culture are the basis of organizational culture	A less suspicious environment and individual culture are the basis of organizational culture	An individual culture and trusting environment are the basis of organizational culture	A supply chain culture and trusting environment are the basis of organizational culture
	Human resources awareness and training	The project does not include awareness and training programs	Preliminary awareness and training programs is provided to a few stakeholders at some stages of the SCPMS project	Preliminary awareness and training programs are provided to all stakeholders at each stage of the SCPMS project	Good awareness and training programs are provided to all stakeholders at each stage of the SCPMS project
Choice of SCPMS framework And defining performance indicators	The existing SCPMS	The SCPMS project does not include an audit of the existing SCPMS	The SCPMS project includes a preliminary audit of the existing SCPMS	The SCPMS project includes a partial audit of the existing SCPMS and determine the degree of his formality and his appropriation by users	The SCPMS project includes a general audit of the existing SCPMS and determine the degree of his formality and his appropriation by users
	Scope of the SCPMS framework	Only financial performance indicators are considered.	Financial performance indicators are measured. In addition, a few non-financial indicators are measured as well.	The financial and non-financial performance indicators was chosen and linked to strategy at different SC levels	A suitable framework of SCPMS was chosen with few financial and non-financial indicators are chosen on a regular basis. The indicators in place reflect the stakeholders' interests. Key processes

					are measured in an integral way.
	A limited number of performance indicators	Too many indicators t hat do not measure all supply chain activities and all Abstraction Levels	A limited number of indicators that do not measure all supply chain activities and all Abstraction Levels	Too many indicators that measure all supply chain activities and all Abstraction Levels	A limited number of indicators that measure all supply chain activities and all Abstraction Levels
	The settings of performance indicators	The settings of performance indicators are not defined	The targets setting of performance indicators are designed	Some settings of performance indicators are defined	All the settings of performance indicators are defined: Data source, Formula, Targets setting, frequency, Responsibility, Suitable aggregation, Cost, Performance drivers, A suitable resources for action to be taken, aggregation, Cause and effect, Security.
Launch SCPMS	Collection and Storage of Data	Most performance-relevant data is collected manually and stored in various formats.	Financial performance data is collected and stored from operational IT systems; however, some manual intervention is needed.	Collection and storage of financial performance data is fully automated; collection and storage of non-financial data needs some manual handling.	Internal and external data sources are exploited. Data collection is fully automated and stored in integrated information system.
	Communicati on of SCPMS reports	Performance reports are disseminated on an ad-hoc basis. Software for data analysis and performance reporting are not used.	Performance reports are disseminated periodically to the upper and middle management by spreadsheets and simple office software.	Clear communication structures are established. Non-financial figures are integral part of reported data. Most results are communicated via push mechanism. Additionally, some performance reports can be accessed electronically.	Financial and non-financial performance results are transmitted to the stakeholders electronically (push option). Additionally, performance results can be accessed electronically at different level of aggregation. Software for data analysis and performance reporting are used.
Improve SCPMS	Consensus and acceptance	They aren't any consensus and acceptance about SCPMS with all Stakeholders	There are a preliminary consensus and acceptance about SCPMS with all Stakeholders	The most Stakeholders agree and accept the SCPMS	All Stakeholders agree and accept the SCPMS
	improvement of information system support to the SCPMS	The information system is not integrated and The most SCPMS reports are communicated by spreadsheets or simple software	The information system is integrated but The most SCPMS reports are communicated by spreadsheets or simple software	The most SCPMS indicators are fully integrated with IS. Specific software for performance reporting is available and used	The SCPMS are fully integrated with IS. The IS are integrated, secure, user friendliness, flexible and include all require functionalities. Business intelligence are used as support to communicate SCPMS report
	Rewards and recognition process	The individual rewards and recognition process aren't linked with the SCPMS	Some individual rewards are linked to the SCPMS	The most individual rewards are linked to the SCPMS	The individual rewards and recognition process are linked with the SCPMS

4. Model Validation

The proposed model has two objectives: first provide a framework to assess maturity level of SCPMS project, and second, offer a support for companies to develop an improvement roadmap to his SCPMS. Our model validation examines whether this model is suited for these two uses.
Two approaches are used to validate this model. The first is a pilot test of the model in a Moroccan supply chain to demonstrate whether it can assess the maturity of SCPMS project and develop an improvement roadmap. The second is an empirical investigation in large sized Moroccan companies of the assessment capability of the model in different industries.

4.1 The Pilot Test

To evaluate the model in an actual industry setting, we conducted a pilot test with Moroccan company that accepts to participate in the study. For confidential reasons we will call this society MARATA.
MARATA is a company specialized in food products for the national market with two sites of production and several distribution warehouses. It belongs to a Moroccan group and it is ranked in 124 within the top 500 Moroccan companies by 73 millions USD. MARATA's supply chain consists of the following processes: planning, procurement, manufacture, delivery and returns management. The market is dominated by MARATA which has increasing competition from other companies recently installed. It is a precursor of pre-sales system in Morocco that improves customer service and optimizes logistics. Delivery is outsourced in some regions (hybrid distribution and wholesalers) for the sake of streamlining. Sales have recorded a growing between 2003 and 2010. The company is based on forecasts for raw materials needs calculations. Production is committed to ensuring three days of stocks to medium-sized sales. Logistics is responsible of dispatching the quantities produced in centers following the level of demand. A returns management system is implemented to deal with returned products by customer, from the client claim to the destruction of items.
Over a period of one year we were member of MARATA's steering committee of the designing and implementing a SCPMS project. We summarize the maturity level of MARATA's SCPMS project in table 3 as it was assessed by authors.
After the assessment of maturity level, based on the proposed model, we developed an improvement roadmap for MARATA Company's SCPMS project as it is shown in table 4.

Table 3: The maturity level of MARATA's SCPMS project

SCPMS Project life cycle stages	***CSFs of SCPMS project***	***Maturity Level of MARATA's CSFs of SCPMS project***	***Maturity Level of MARATA's stages of SCPMS project***
Project initiation	The Steering committee	Level 2	Level 2
	The motivations of the project	Level 2	
	BPM of supply chain	Level 3	
	Cost of SCPMS project	Level 3	
Human resources	Project management Style	Level 4	Level 2
	Organizational culture and trusting environment	Level 2	
	Human resources awareness and training	Level 2	
Choice of SCPMS framework And defining performance indicators	The existing SCPMS	Level 4	Level 3
	Scope of the SCPMS framework	Level 3	
	A limited number of performance indicators	Level 3	
	The settings of performance indicators	Level 3	
Launch SCPMS	Collection and Storage of Data	Level 3	Level 3
	Communication of SCPMS reports	Level 3	
Improve SCPMS	Consensus and acceptance	Level 2	Level 2
	improvement of information system support to the SCPMS	Level 3	
	Rewards and recognition process	Level 2	

Table 4: The improvement roadmap for MARATA Company's SCPMS project

SCPMS Project life cycle stages	***CSFs of SCPMS project***	***Improvement roadmap of MARATA's CSFs of SCPMS project***
Project initiation	The steering committee	Ensure a wide participation of stakeholders and functions of the supply chain in the steering committee
	The motivations of the project	The motivations of the project must be more challenging (strategic alignment, continuous improvement, management control, decision support, communication support)
	BPM of supply chain	Guarantee a global BPM of SC before the project
	Cost of SCPMS project	Launch a global study on the cost and the economic efficiency of the SCPMS project
Human resources	Project management Style	Maintain a participatory style in the project
	Organizational culture and trusting environment	Create a trusting environment and initiate a SC culture
	Human resources awareness and training	Provide an awareness and training programs to all stakeholders at each stage of the SCPMS project
Choice of SCPMS framework And defining performance indicators	The existing SCPMS	Maintain a general audit of the existing SCPMS
	Scope of the SCPMS framework	Choose a suitable framework for SCPMS project
	A limited number of performance indicators	Choose a limited number of performance indicators that measure all supply chain activities
	The settings of performance indicators	Define all settings of performance indicators
Launch SCPMS	Collection and Storage of Data	Automate data collection and storage in integrated IS
	Communication of SCPMS reports	Use reporting software for communications of reports
Improve SCPMS	Consensus and acceptance	Create Stakeholders consensus and acceptance about SCPMS
	improvement of information system support to the SCPMS	Improve SI integration and link it to the SCPMS
	Rewards and recognition process	Link the most individual rewards to the SCPMS

4.2 An empirical investigation in large sized Moroccan companies

To analyze the validity of the proposed model, we will use it to measure the SCPMS project maturity in Moroccan firms. We have chosen for our study the top 500 Moroccan companies ranked by turnover. We hope that in this category of companies, the project management, performance management and supply chain culture are more developed to success our empirical investigation.

Over the past decade, Morocco has embarked on an ambitious program of structural reforms in several fields, aiming to further liberalize its markets and enhance the competitiveness of its economy. However Morocco is not a leader in the area of supply chain management, the country is significant in terms of internal markets and international trade. Therefore, there are many international world-class supply chain service providers participating in different Moroccan economic sectors.

In this section we will try to give an answer, with reference to the context investigated, to the following research question: What are the maturity levels that characterize SCPMS project's in large sized Moroccan Companies?

The research question will be answered through hypotheses testing. For this question we propose one hypothesis: A company could be very advanced regarding one stage of SCPMS project life cycle, while being rather antiquated regarding another.

In order to examine the above research question, a survey method was selected rather than the case study approach because while case study research is used to explore build definitions and generate hypotheses, survey research allows testing of hypotheses and theory construction [45].

The total population investigated was constituted of the top 500 Moroccan companies ranked by turnover. Based in 2008 ranking, the turnover of this Moroccan enterprises category is comprised between 16 millions and 3 752 millions USD. Through a stratified random sampling, dividing the population into strata according to wide range of industry settings and size, a probabilistic sample of 200 companies was obtained. The sample is composed of companies from different economic sectors. This includes manufacturing, construction, retail, graphics, mining, communication, information technology, utilities and distribution industries.

The maturity model of SCPMS project presented in this paper was used in developing a survey in order to evaluate the level of maturity of SCPMS project in large Moroccans companies. The instrument used is a structured four-page questionnaire and 74

variables that allow the researchers to collect data pertaining to maturity model of SCPMS at each stage of life cycle project. Also we make sure that the form and the questions would be unequivocal and easy to answer, in order to avoid possible ambiguity for the reader [46]. Most of the answers of questions are based on a categorical or ordinal scale. We were assured that the categories were mutually exclusive, but also collectively exhaustive, including the "Other, please specify" category when needed [47]. Besides, the survey was sent to the colleague's searchers in order to give their feedback about the instrument and to test that the questionnaire will accomplish the study objectives.

To reach the respondents, an electronic self administered survey was conducted between May and December 2009. The survey is sent to sample of 200 large Moroccan companies by email attachment in WinWord format. Within each company the survey was addressed to one person at management level (Supply chain manager, CEO, IT manger, Production manager, Management controller, Commercial Manager, Human resources Manager).

From the 200 questionnaires mailed, only 45 completed responses were returned. The response rate is 22.5%, which meets Malhotra and Grover's 20% response rate hurdle [45].

The profile distribution frequency of the respondents was then examined. The surveys depict that the respondent's profile are managers. As shown in Table 5, 40 % of the respondents were supply chain managers and 33 % were production managers.

Table 5: Position by the respondents

	Frequency	Pour cent
Supply chain Manager	18	40%
IT Manager	4	9%
Production Manager	5	11%
Management controller	15	33%
CEO	1	3%
Commercial Manager	1	2%
Human resources Manager	1	2%
Total	45	100.0

As shown in Table 6, the majority of enterprises in sample operate in the Agribusiness 24% followed by 18% of Distribution. 40% of the companies were international companies; while 82% were a filial of group.

Table 6: Companies' division

	Frequency	Pour cent
Agribusiness	11	24%
Motor vehicles	5	11%
Building	3	7%
Electricity	3	7%
Others	6	13%
Paper / Cardboard	2	4%
Textile	4	9%
Transportation	3	7%
Distribution	8	18%
Total	45	100%

As exposed in table 7, it was found that the maturity of the different stages of life cycle SCPMS project was independent from each other and that a particular company could be very advanced regarding one stage, while being rather antiquated regarding another stage. The results show that the average of maturity level of different stages of life cycle SCMPS is near to the level 2.

From the analysis of the "Initiation Project" maturity stage results, it emerged that only a 26% have a level between 3 and 4. We can conclude that the majority of Moroccan large sized companies don't pay attention to this stage.

Also we note that the "Human resources preparation" stage is neglected by these companies (62% in level 2 and 27% in level 1).

In addition the Moroccan companies give more importance to "Choice of SCPMS framework and defining performance indicators" stage (36% between level 3 and 4).

Indeed the "Launch SCPMS" is the more advanced maturity stage of the SCPMS project (45 % between level 3 and 4 and only 4% in level 1). This demonstrates that the Moroccan large companies focus their efforts at SCPMS project on the technical aspects of the implementation of performance indicators (Collection of Data and Storage, Communication of CMPS reports). The "Improve SCPMS" stage is the most basic stage (96 % between level 1 and 2).

We have cited that 44% of the sample companies are not satisfied about their SCPMS and 36% plan to launch a project to improve their SCPMS. This proves that Moroccan firms are aware of their SCPMS project maturity level and they are establishing a dynamic of continuous improvement performance. The survey's results reflect an "Adolescent" level of maturity of performance management supply chain, representing opportunities for large sized Moroccan companies' improvement. Also the empirical analysis demonstrates the capacity of the proposed model to asses the maturity of the SCPMS project in different industries.

5. Conclusion and Future Research

Based on the critical factors success on the one hand, and an analysis of the maturity models of Supply chain and performance measurement system on the other, a four-stages Maturity Model for SCPMS project has been developed. The suggested Maturity Model makes it possible for a SC to assess there SCPMS project and how it can be improved.

Just as with the pilot test and the empirical investigation carried out to validate the maturity model for SCPMS project, these results seem to be

more interesting in assessing maturity level and developing improvement roadmap. There are, also, some evidences from the results which that the maturity for SCPMS is at round "Adolescent" level. It was found that the maturity of the different stages of life cycle SCPMS project was independent from each other. Indeed the pilot test is very advanced regarding one stage, while being rather antiquated regarding another stage. Hence we might conclude that the stages which are mainly determined by technical aspects are more advanced than those stages that are process and people related. Also, the basic maturity level in the last stage proves that the Moroccan large sized companies have to launch a new project to improve their SCPMS.

While doing some works in the future the suggested Maturity Model should be examined with other empirical studies in different contexts. Also there is a challenge on how to adapt the proposed maturity model for SMEs companies.

Table 7: Maturity level for each stage of life cycle SCPMS project

	Life cycle SCPMS project					
Maturity level	Project initiation	Human resources preparation	Choice of SCPMS framework And defining performance indicators	Launch SCPMS	Improve SCPMS	
Level 1 Ad-hoc	21%	27%	24%	4%	56%	26%
Level 2 Adolescent	53%	62%	40%	51%	40%	49%
Level 3 Grown-up	24%	11%	33%	27%	4%	20%
Level 4 Mature	2%	0%	3%	18%	0%	5%
	100%	100%	100%	100%	100%	100%
Mean	2.09	1.84	2.13	2.58	1.49	2.02
Std. Deviation	.73	.60	.81	.83	.58	

References

[1]L. Berrah, and C. Vincent, "Towards an aggregation performance measurement system model in a supply chain context", Computers in Industry, Vol. 58, No. 7, 2007, pp. 709-719.

[2]E. U. Olugu, and K. Y. Wong, "Supply Chain Performance Evaluation: Trends and Challenges", American J. of Engineering and Applied Sciences, Vol. 2, No. 1, 2009, pp. 202-211.

[3]P. Charan, R. Shankar, and R. K. Baisya, "Modelling the barriers of Supply Chain Performance Measurement System implementation in the Indian automobile supply chain", International Journal of Logistics Systems and Management, Vol. 5, No. 6, 2009, pp. 614-630.

[4]H. Forslund, and P. Jonsson,, "Selection, implementation and use of ERP systems for supply chain performance management", Industrial Management & Data Systems, Vol. 110, No. 8, 2010, pp. 1159-1175.

[5]M. Najmi, J. Rigas, and I. S. Fan, "A framework to review performance measurement systems", Business Process Management Journal, Vol. 11, No 2, 2005, pp. 109-122.

[6]J. Cai, X. Liu, Z. Xiao, and J. Liu, "Improving supply chain performance management: A systematic approach to analyzing iterative KPI accomplishment", Decision Support Systems, Vol. 46, 2009, pp. 512-521.

[7]D. Y. Kim, and G. Grant, "E-government maturity model using the capability maturity model integration", Journal of Systems and Information Technology, Vol. 12, No. 3, 2010, pp. 230-244.

[8]X. Zhang, and X. Wang, "Fuzzy evaluation of Project Management Maturity model based on neural network", Advanced Management Science, Vol. 9, No. 11, 2010, pp. 527-531.

[9]Project Management Institute (PMI), OPM3, Organizational Project Management Maturity model, Knowledge foundation, Newtown Square, 2008.

[10]P. Cocca, and M. Alberti, "A framework to assess performance measurement systems in SMEs", International Journal of Productivity and Performance Management, Vol. 59, No. 2, 2010, pp. 186-200.

[11]T. Wettstein, and P. Kueng, "A maturity model for performance measurement systems", in: C.A. Brebbia, P. Pascolo, (Eds.), Management Information Systems GIS and Remote Sensing, WIT Press, Southampton, 2002.

[12]K. McCormack, MB. Ladeira, and MPV. Oliveira, "Supply Chain Maturity and Performance in Brazil", Supply Chain Management, Vol. 13, No 4, 2008, pp. 272-282.

[13]H.G. Reyes, and R. Giachetti, "Using experts to develop a supply chain maturity model in Mexico", Supply Chain Management, Vol. 15, No. 6, 2010, pp. 415-424.

[14]M. Niazi, D. Wilson, and D. Zowghi, "A maturity model for the implementation of software process improvement: an empirical study", Software Process: Improvement and Practice, Vol. 11, No. 2, 2006, pp. 193–211.

[15]P. Trkman, M. I. Štemberger, and J. Jaklic, A., "Groznik, Process approach to supply chain integration", Supply Chain Management, Vol. 12, No. 2, 2007, pp. 116–128.

[16]R. Bhagwat, M.K. Sharma, "Performance measurement of supply chain management: A balanced scorecard approach", Computers & Industrial Engineering, Vol. 53, No. 1, 2007, pp. 43-62.

[17]P. Gaiardelli, N. Saccani, and L. Songini, "Performance measurement of the after-sales service network-Evidence from the automotive industry", Computers in Industry. Vol. 58, 2007, pp. 698–708.

[18]C. Hombourg, "Improving ABC heuristics by higher level cost drivers", European Journal of Operational Research, Vol. 157, 2004, pp. 332-343.

[19]M. Bourne, A. Neely, J. Mills, and K. Platts, "Implementing performance measurement systems: a literature review", Business Performance Management, Vol. 5, No. 1, 2003, pp. 1-24.

[20]A. Schneiderman, "Why balanced scorecards fail", Journal of Strategic Performance Measurement, 1999, pp. 6–11.
[21]T. Cooke-Davies, "The real success factors on projects", International Journal of Project Management, Vol. 20, 2002, pp. 185–190.
[22]L. Bourne, and D.H.T. Walker, "Project relationship management and the Stakeholder Circle™", International Journal of Managing Projects in Business, Vol. 1, No. 1, 2009, pp. 125-130.
[23]F. Franceschini, M. Galetto, and D. Maisano, Management by measurement: designing key indicators and performance measurement systems, Berlin: Springer Verlag, 2007.
[24]X. Li, X. Gu, and Z. Liu, "A strategic performance measurement system for firms across supply and demand chains on the analogy of ecological succession", Ecological Economics, Vol. 68, No. 12, 2009, pp. 2918–2929.
[25]D. M**.** Lambert, Supply chain management: processes partnerships performance, USA, 2008.
[26]P. Kueng, and A.J. Krahn, "Building a process performance measurement system some early experiences", Journal of Scientific & Industrial Research, Vol. 58, 1999, pp. 149–159.
[27]A. Yilmaz, and C.G. Atalay, "A Theoretical Analyze on the Concept of Trust in Organisational Life", European Journal of Social Sciences, Vol. 8, No. 2, 2009, pp. 341-352.
[28]M.L. Lengnick-Hall, C.A. Lengnick-Hall, L.S. Andrade, and B. Drake, "Strategic human resource management: The evolution of the field", Human Resource Management Review, Vol. 19, 2009, pp. 64–85.
[29]A. E. Ellinger, A. B. Elmadag, and A. D. Ellinger, "An examination of organizations' frontline service employee development practices", Human Resource Development Quarterly, Vol. 18, No. 3, 2007, pp. 293-314.
[30]R.M. Monczka, R.B. Handfield, and L. Giunipero, Purchasing and Supply Chain Management, USA: South-Western, 2009.
[31]U. S. Bititci, K. Mendibil, S. Nudurupati, T. Turner, and P. Garengo, "The interplay between performance measurement organizational culture and management styles", Measuring Business Excellence, Vol. 8, 2004, pp. 28-41.
[32]M. Wouters, and C. Wilderom, "Developing performance-measurement systems as enabling formalization: a longitudinal field study of a logistics department", Accounting Organizations and Society, Vol. 33, No. (4/5), 2008, pp. 488-516.
[33]B. Andersen, and T. Fagerhaug, Performance measurement explained: designing and implementing your state-of-the-art system, USA: American Society for Quality, 2001.
[34]M. Wouters, and M. Sportel, "The role of existing measures in developing and implementing performance measurement systems", International Journal of Operations & Production Management, Vol. 25, 2005, pp. 1062 – 1082.
[35]B. Beamon, "Measuring supply chain performance", International Journal of Operations and Production Management, Vol. 19, No. 3, 1999, pp. 275–292.
[36]A. Gunasekaran, C. Patelb, and R. E. McGaughey, "A framework for supply chain performance measurement. International Journal of Production Economics", Vol. 87, No. 3, 2004, pp. 333–347.
[37]D. Medori, and D. Steeple, "A framework for auditing and enhancing performance measurement systems", International Journal of Operations & Production Management, Vol. 20, No. 5, 2000, pp. 520-533.
[38]P. Taticchi, and KR. Balachandran, "Forward performance measurement and management integrated frameworks", International Journal of Accounting and Information Management, Vol. 16, No. 2, 2008, pp. 140-157.
[39]J. Ukko, J. Tenhunen, and H. Rantanen, "Performance measurement impacts on management and leadership: Perspectives of management and employees" Production Economics, Vol. 110, 2007, pp. 39–51.
[40]C. Wei, and L. Chen, "Developing Supply Chain Management System Evaluation Attributes Based on the Supply Chain Strategy", in: V. Kordic, (Eds.), Supply Chain Theory and Applications, Vienna: I-Tech Education and Publishing, 2008.
[41]S. Blanc, Y. Ducq, and B. Vallespir, "Evolution management towards interoperable supply chains using performance measurement", Computers in Industry, Vol. 58, 2007, pp. 720–732.
[42]B. Carreira, Powerful Tools for Dramatically Reducing Waste and Maximizing Profits, New York: AMACOM, 2005.
[43]T. J. Cooke-davies, and A. Arzymanowc, "The maturity of project management in different industries An investigation into variations between project management models", International Journal of Project Management, Vol. 21, 2003, pp. 471-478.
[44]A. F. Bay, and M. Skitmore, "Project management maturity: some results from Indonesia", Journal of Building and Construction Management, Vol. 10, 2006, pp. 1-5.
[45]M. K. Malhotra, and V. Grover, "An assessment of survey research in POM from construct to theory", Journal of Operations Management, Vol. 16, 1998, pp. 407-425.
[46]C. Forza, "Survey research in operations management: a process-based perspective", International Journal of Operations & Production Management, Vol. 22, No 2, 2002, pp. 152-194.
[47]L.M. Rea, and R.A. Parker, Designing & Conducting Survey Research, San Francisco: Jossey-Bass., 2005.