**Maintaining firms’ competitiveness through BPM implementation: A case study of Moroccan firms**

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**Abstract**

Nowadays, Moroccan firms are still struggling with internal issues. However, competing effectively within the global market challenges firms to manage their whole business and upgrade their competitiveness. In this context, Business process management (BPM) is advocated for many ways. The most significant reason is that it allows business process understanding and ensures fluent communication between the supply chain upstream and downstream actors.

The present research sheds light on the effect of adopting the BPM as a successful tool to manage firms’ activities. The theoretical aspect of implementing BPM and its effect on firm competitiveness is analyzed. This paper focuses mainly on analyzing some specific business aspects which are affected positively by the BPM implementing and facilitate the run of the process optimization. These effects are studied through an empirical study. A survey questionnaire is conducted within the Moroccan industrial firms. This study confirms the positive effect of implementing BPM on business competitiveness especially with regard to reducing time and costs.

**Keywords**: Business process modeling, globalization, competitive advantage, sustainable performance, reverse flow.

**Introduction**

Nowadays, all firms are negatively affected by globalization, unless they are well equipped to face the fierce competition in the global market. Business process organization and optimization are required to remain competitive[[1]](#footnote-1). In this paper we shed light on the benefit of BPM implementation through business process modeling for securing business agility and competitiveness. The main aim is to commit the firms on a no-stop improvement mission and hence sustain its business growth. Indeed, it’s about a never-end improvement process, it doesn’t end by reaching firms’ objectives but each arrival point represents a departure point for the next improvement mission.

Implementing BPM within the firm should be adapted to its needs and not merely established in a procedural manner. Of course firms should follow a series of steps in chronological order for successful BPM implementation, yet defining the goals behind the BPM implementation is crucial[[2]](#footnote-2).

This paper is divided into two main parts, the first is dedicated to analyzing the theoretical aspect of implementing BPM within the firm; we analyze the steps to follow for a successful BPM implementation and how it can affect business competitiveness focusing mainly on some specifics key elements that may be affected as time, cost and quality. Then, the second part is devoted to exposing the empirical results of the survey questionnaire conducted within the Moroccan industrial firms to check the possible impact of implementing the BPM on securing competitive advantage especially focusing on it effect on time, cost and non-quality reduction.

1. **Theoretical background**

Business process management is more than a tool meant to organize business activities, it is actually a culture to settle and exemplar users’ behaviors to instill. Indeed, the commitment of users in charge of managing processes is shown daily while dealing with facing no-conformities or dysfunction[[3]](#footnote-3).

Process models are said to be a key instrument providing a clear overview of the business processes and their interaction, allowing a good understanding of the process functioning that facilitate the business optimization and automatization[[4]](#footnote-4). They are actually based on the accuracy of the firm’s objectives and their agreement with its strategic goals and available resources to target the fixed objectives [[5]](#footnote-5)&[[6]](#footnote-6). For successful Business process modeling implementation, we focus mainly on the definition of the objectives before the launch of the process modeling cycle. Here below, the table 1 that encompasses the main BPM objectives identified from the literature:

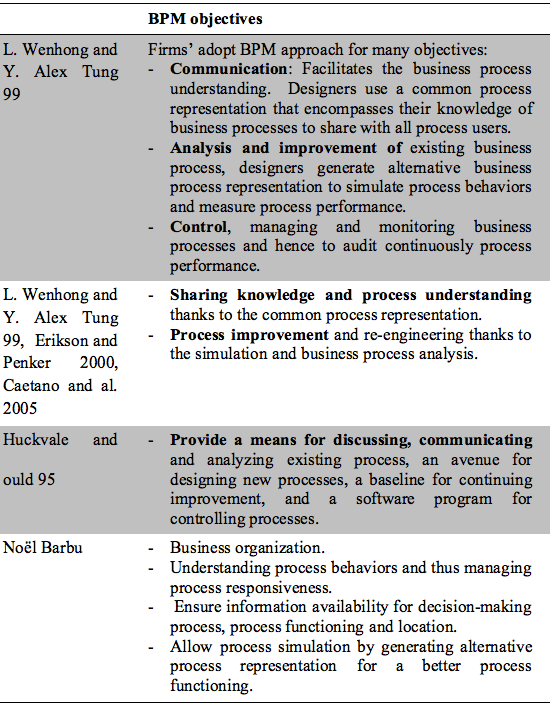


Table 1. bpm objectives (a literature reviews)

Curtis and al. (1992) highlights that firms use the BPM for many reasons; the most common reasons include facilitating the process understanding by using a common process representation and also providing firms with a basis for process management and improvement. The latter allows understanding the process behaviors and hence leads to adequate performance measurement and analysis. BPM provides users with the necessary information thanks to the process detail adopted[[7]](#footnote-7). Of course as highlighted previously, the set objectives determine the level of process detail to adopt.

It goes without saying that firms implement the BPM to reach their goals that should go hand in hand with both their business strategic objectives and available resources. Random business goals setting would lead to the failure of the BPM project and jeopardize the firms expected business performance.

After defining firm objectives comes the cycle of modeling new business processes or analyzing and improving existing business processes, both should observe the order of these steps presented in the figure 1 here below:

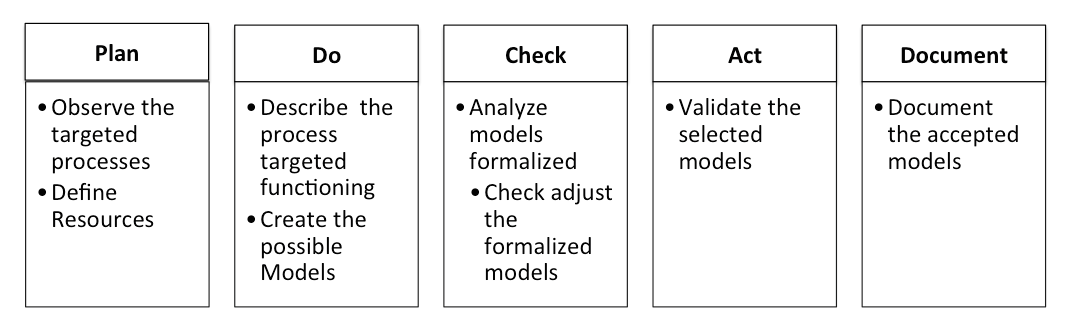


Figure1. Business process modeling cycle: A personnel construct inspired from the PDCA cycle.

This BPM cycle is inspired by the steps of the revised PDCA cycle that in addition encompasses as a final step documentation of the final process representation to follow. Obviously, the user’s awareness and skills are the core element in all business process implementation steps. The deep understanding of the current situation is the main pillar to rethink the process to follow or to expect the improved processes and the to be business organization.

The first and the most important step for the process modeling implementation is related to the observation of the functioning of the existing business process so as to better understand the behaviors, or think of possible process progress, and then to define the necessary resources to launch the process formalization or even the process of optimization mission for existing processes. The latter may come from a voluntary top management decision or also from a malfunctioning detection. When the faulty process is spotted and the necessary resources for each step are defined, the process progress should be carefully described to target the origin of this malfunctioning and come up with possible scenarios that may be the subject of the new process to enact. Then comes the analysis step to prove the good functioning of proposed process through experimentation. This allows adjusting and confirming the relevance of the provided process. Finally, the approved process is validated and then should be documented. This improved process will be the official process to follow for the operational level[[8]](#footnote-8).

While using the appropriate BPM tool and the needed level of detail, it is likely to reach some BPM advantages that are exposed in the second part of this first section.

1. **Advantage of implementing Business process modeling**

Any company that establishes BPM expects a business organization and improvement by taking advantage of information availability and fluent communication between all business process users[[9]](#footnote-9). Of course process analysis and understanding provide several benefits especially in terms of time, direct and indirect costs[[10]](#footnote-10). In the table 1 below we analyze how BPM implementation leads to reducing time, cost and enhancing decision-making quality and process quality as a whole. Time has been described as both a source of competitive advantage and a fundamental measure of firm’s performance[[11]](#footnote-11). It automatically results in a cost saving. This relies on the availability of necessary information, it quality and precision that allow the understanding of process behavior and analysis of invaluable tasks that doesn’t generate value for the final costumer which are to eliminate.

|  |  |
| --- | --- |
| **Dimension** | **Benefits of BP management & BPMN** |
| **Time** | BPM enables firm to synchronize multi-tasks from different level regardless of the areas of performing.  BPM allow process analysis and it leads to reducing the inutile moving and waiting time between sequences tasks.  With regard to the BPM four perspectives (behavioral, functional, informational and operational perspective), it allows firm to know at any time which activities are being performed and how they are performed using mechanisms such as feedback loops[[12]](#footnote-12). Thanks to the level of detail available on the sub-process it enables users to locate unnecessary tasks to eliminate and combine small tasks into composite ones[[13]](#footnote-13). |
| **Cost** | Process formalized allows users to automatically target the optimal cost for each operation by a simple reading[[14]](#footnote-14) &[[15]](#footnote-15).  The adequate level of detail and precision of the BPM allows through frequent analysis and control of workflow, to detect problems at the early stage and minimize not only the time required for controlling and decision making, but also the no quality cost as the cost of product recall (unwanted for no conformity to client need) and rework (for repairable product). |
| **Flexibility** | Flexibility can be defined as “the ability to react to changes”. The greatest benefit of BPM is the agility gained by having access to data and visibility across the BPMN. It gives to the firm the ability to continuously modify and adapt their processes. Hence enhances firms’ flexibility and adaptability to any external/ internal changing situation[[16]](#footnote-16) &[[17]](#footnote-17). |
| **External quality**  **Client satisfaction** | The adequate use of such tool empowers firms to develop visibility and gain a clear understanding of its orientation so as to respond to any external request providing the right information. This result in long term, it builds trust and commitment between supply chain partners[[18]](#footnote-18) &16.  The satisfaction of a customer with the process is related to how a workflow is executed. BPM enables to develop flexibility, responsiveness and also serviceability that are summarized in the speed and ease of correcting mistakes or responding on time to customers’ requirement. |

Table2. Advantage of using BPM tool for firms’ competitiveness

Assuming that BPM leads to business organization and hence optimization, it is worth to highlighting that many BPM tools exist and the choice is related to firm needs and predefined objectives. It is also advocated to devote time to selecting the level of detail required for a better process understanding and analysis. Tool selection is as important as the firm’s objective definition[[19]](#footnote-19).

In the second part of this paper we analyze the results of the survey questionnaire conducted within the Moroccan firms. Before dealing with the results, it is essential to present our methodological approach detailed here below.

1. **Research Methodology and Hypotheses**

The conducted study aims at conceptualizing a model to explain the possible interrelationships between the BPM implementation and securing competitive advantage, we have carefully analyzed the effect of BPM on some specifics pillars of firms’ competitiveness such as time, cost and global quality. The model outlines some relations that were highly approved and tested in previous research but our motivation is to elaborate a complete model that would allow us to check how BPM can affect each retained variables and how these variables can affect one another.

The present research adopts a quantitative research paradigm demonstrating the main aspects of hypothetico-deductive reasoning. Our choice is based upon several specificities of this study as the need to collect data that are necessary to check the validity of our conceptual model and hence our hypotheses. And above all, the model conceptualization stemmed from the theoretical research conducted at the early stage of this research. The survey questionnaire consists of 35 questions organized in sets and each set refers to a specific component of the firm’s competitiveness including: cost, time and users behaviors to face non-quality and non-conformities. The first set labeled the fielding set, it is dedicated to general questions that allow us to identify the enterprises that have already modeled their business processes. And above all, our questionnaire targets, industrial firms regardless of their activity sector or the kind of modeling tool or formalism detail they adopt. This choice is based on the nature of our questionnaire survey items are mostly dedicated to industrial firms. We collected 200 questionnaires and only 129 are accepted.

Our questionnaire as mentioned above is divided into four blocks; each block is dedicated to check the validity of one of the five hypotheses. Here below we present our five hypotheses to check the possible effect of BPM implementation on reducing time, cost and no quality within the firm:

**Hypothesis 1: BPM is time- saving**

To check the possible effect of BPM implementation on time saving, many questions are compiled which meant to raise several key aspects of time saving, including its effect on quick decision-making, the understanding of process activities and analysis of invaluable tasks that are to remove. Some also investigate time to market and the choice of the adequate channels to respond to client requests and needs at the right time. Many questions are devoted to checking the impact of BPM on process synchronization as we analyze in this set of questions the waiting time between process activities. Thanks to BPM perspectives especially the functional and behavioral perspectives, businesses can assess different types of business process-related information and ensure timely information about what activities are performed which significantly allow the preparation, organization and anticipate the steps to follow. Undoubtedly, the availability of information guarantees a good visibility of the whole process in terms of who does what, when, how and where; which facilitates in case of detecting no-conformities to directly targeting the faulty steep as well as the user responsible for to deal with internal or external client claim.

**Hypothesis 2: BPM is cost saving**

To check this hypothesis, we included in our questionnaire a set of questions to analyze how BPM leads to saving costs. And how can BPMs’ behavioral and organizational perspectives facilitate the ease of detecting no-conformities and how it contributes to making the information accessible to all process users. As we know on time when and how activities are performed and by whom, and also the process progressing how all tis information allow experts to point the process deficiency as repetitive tasks that are to eliminate, and if firms are equipped with the monitoring that allows to quantify resource consumption, it become possible to define which process phase is highly costly and will be the subject of investigation and hence optimization. At the end, we added some questions dedicated to check the possible implementation of appropriate plans to limit non-conformities occurrence and hence to limit the processing cost affecting firms’ financial performance as a whole.

**Hypothesis 2 a: time saving lead indirectly to cost saving**

As it is evident, each component of saving time leads indirectly to saving costs, that was our motivation to come up with the hypothesis formulated above.

Our aim is to examine whether it is possible effect of time saving on the cost saving. It would be highly worthwhile to devote effort to thinking how to reduce processing-time, lead-time, waiting time and decision-making time to increase performance and cost saving indirectly.

**Hypothesis 3: BPM lead to reducing no quality**

For the last hypothesis, which is dedicated to analyze how BPM leads to reducing non-quality within the firm, or how it allows the enhancement of the global quality. The main aim is not product quality itself, but the process and decision-making quality as we also look into the available information and sharing knowledge quality. Of course the relevance of the process relies on understanding each step and its adequate representation, which allows sharing knowledge between all process users. Also, process designers provide users with the necessary information that enables them to handle the process efficiently. The informational and the behavioral perspectives are of tremendous importance in the phase of analyzing how and when process activities are performed and what information entities are created and processed during each activity. They contribute to the preparation of the process progress and of the necessary resources from raw materiel to labor resource required for the process functioning.

This set of questions includes questions emphasizing the importance of process documentation through the human factor which is the key success of BPM implementation and operationalization within the firm, especially in the steep of detecting no-conformities and quick launch of the decision-making process and time-wise corrective actions to address the identified issues and plan to limit their occurrence. We stress the particular importance of documenting any taken decision to insure the reuse of these later while facing the same issue, which is formalized through questions aiming to check if the process of documenting any change on the original process is respected.

As is it mentioned in the analysis of this hypothesis, the non-quality generates costs for the enterprise, and, of course reducing this later can generate a value for the enterprise and for the final client. For this we include in our investigation the examination on the possible relation between the non-quality reduction and enterprise cost reduction, which is formulated in the hypothesis as follows:

**Hypothesis 3a: Non-quality reduction leads saving the costs**

Certainly, the interaction between all these competitiveness pillars is worth highlighting since each one affects the others directly or indirectly, but the quality and availability of information along with the user’s awareness and teams’ responsiveness are paramount to achieve firms’ objectives.

From our theoretical research and generated hypotheses, we conceptualize the model presented here below that will be tested, adjusted if necessary and validated in the next part of this research.

Figure2. Conceptual modele

In order to verify the proposed conceptual model consistency, we follow some steep that are discussed here after.

**Analysis methodology**

Regarding our types of variables and the conceptual model we have opted for using the Smart PLS software using the partial least squares path modeling.

The steps involved in the data analysis are summarized below

* Analyzing the loading of each item
* Analyzing the consistency of the measurement model
* Analyzing the consistency of the structural model
* Testing statistically our hypotheses

1. **Outer loading:**

We start our dada analysis by testing the load of each item. This step necessitates checking the reliability of each used item and whether it adequately explains the variable it belongs to, which is actually done by analyzing the obtained score calculated automatically by the Smart PLs software. This measure indicates if the item contributes to its assigned construct or not[[20]](#footnote-20).

If the obtained score is:

Above 0,7: the item strongly contributes to its assigned construct is to retain directly.

Below 0,7 but it exceeds 0,4: we should analyze its impact before deciding to retain or delete the item. If the suppression of the item impacts the composite reliability we keep it, or we withdraw it. In some exceptional cases, we admit to keep these items if they are tightly linked to the variable which is important to our analysis.

Less than 0,4: it means low conformance of the reflective items and it is to remove. (Hulland 1999, p 198)[[21]](#footnote-21)

The results are represented in figure 3.

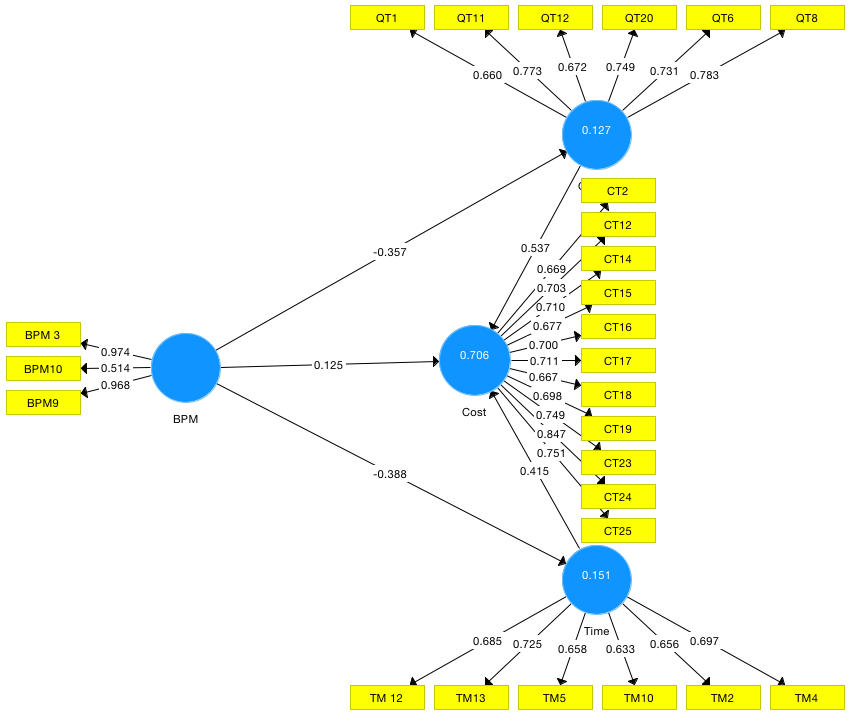


Figure 3. Model construct with outer loadingmeasurement.

As the global model encompasses the measurement model and the structural model, the second step of this analysis consists of checking the internal consistency of the measurement model, which is done through analyzing the cronbach’s Alpha, composite reliability, variance extracted and then assessing the discriminant validity by the same software Smart PLS. For the structural model, we focus on analyzing the goodness of fit measure.

**2- Testing the consistency of the measurement model**

As mentioned earlier for the calculation measures, this step starts with analyzing three measures Cronbach’s Alpha, Rho-A and the composite reliability to estimate true reliability.

**Composite reliability (CR)**

The composite reliability is a linear combination of a multi construct variables selected to test the measurement model. This indicator allows a deep estimation of the construct internal reliability. The level of acceptance of the composite reliability:

* *CR> O,7: Good internal validity;*
* *0,6< CR< 0,7: Moderate validity but acceptable;*
* *0,4<CR<0,5: Low reliability, acceptable;*
* *CR<0,4: Very low, not acceptable and to eliminate.*

**Cronbach’s Alpha**

Cronbach’s Alpha analyzes the consistency of the internal model. It provides an estimation of the reliability based on inter-correlation of indicators measuring the construct variables. The level of acceptance of Cronbach’s alpha should be more or equal to 0,7. If it scores less than 0,7, it is not acceptable.

**Rho-A**

The Rho-A called also the Rho of Dillon Goldstein is a test which allows the reliability of the measure precision for analyzing the construct. The level of acceptance of Rho-A should also be more or equal to 0,7. If it is less than 0,7, it is it not acceptable.

Table 3 below shows the scores obtained by Smart PLS 3 for each measure.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Cronbach's Alpha** | **rho\_A** | **Composite Reliability** | **Average Variance Extracted (AVE)** |
| **BPM** | **0,731** | **0,870** | **0,833** | **0,577** |
| **COST** | **0,906** | **0,908** | **0,921** | **0,516** |
| **QTY** | **0,823** | **0,829** | **0,872** | **0,532** |
| **TIME** | **0,766** | **0,765** | **0,835** | **0,457** |

Table 3. Measures generated by Smart PLS

As it is shown, all measures are above 0,7 which is the acceptance score. Some are even above 0.9 which means a large acceptance of the measures. For the average variance extracted of time, it is under 0,5, which is the level of acceptance[[22]](#footnote-22), but referred to Ringle and al. (2005), we can admit the score 0,457 which is also acceptable[[23]](#footnote-23).

Since all our measures are in the level of acceptance, we are allowed to continue our analysis and analyze the HTMT ratio to check the discriminant reliability.

**Discriminant reliability**

**Heterotrait- Monotrait Ratio of correlation (HTMT)**

The HTMT criterion is used to assess discriminant validity, this ratio allows us to check if the relation has been established between reflective constructs’ variables. This test ensures that there is a strong relationship between the reflective construct and its own indicators.

* *If the score of HTMT< 0,9 it is acceptable,*
* *If the score obtained is above 0,9 this measure is not acceptable.*

The table 4 below represents the obtained score of the HTMT ratio calculated by the Smart PLS:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **BPM** | **COST** | **QTY** | **TIME** |
| **BPM** |  |  |  |  |
| **COST** | **0,268** |  |  |  |
| **QTY** | **0,422** | 0,889 |  |  |
| **TIME** | **0,545** | 0,853 | 0,898 |  |

Table 4. HTMT measures

All measures are below 0,9. Thus all these measures are accepted. This is the last measure for assessing the consistency of the measurement model. As the measurement characteristics of construct are acceptable this enable us to continue with the assessment of the structural model.

1. **Assessing the validity of the structural model**

**R square (R2)**

The R-squared (R2)is the coefficient of de termination, called also the multiple regression coefficients, it is a determination coefficient that informs how closer are the indicators to the regression line. Also it represents the percentage of variation of the variable explained by the linear model. The R2 varies between 0 and 1 and it indicates how the variance in the construct is explained. Table 5 below represents the obtained measures by Smart Pls software.

|  |  |
| --- | --- |
|  | **R Square** |
| **Cost** | 0,706 |
| **Quality** | 0,127 |
| **Time** | 0,163 |

Table 5. R squared measures

* 1. **Goodness of Fit (GoF)**

The goodness of fit (GoF) has been developed as an overall measure of model fit for PLS-SEM[[24]](#footnote-24). This measure tests the consistency of the global model.

* *If GoF < 0,1 doesn’t much*
* *If 0,1<GoF<0,25 low*
* *If 0,25<GoF<0,36 accepted*
* *If GoF> 0,36 large acceptance*

|  |  |  |
| --- | --- | --- |
|  | **R Squared** | **AVE** |
| **Cost** | 0,706 | 0,516 |
| **Quality** | 0,127 | 0,532 |
| **Time** | 0,163 | 0,457 |
| **Geometric Mean** | 0,24 | 0,54 |

Table 6. Goodness of fit measurement

***GOF*** *=*

The GoF : 0,37 ; **GoF > 0,36**

The goodness of fit score is 0,37, which is a largely accepted score and means that our model is validated[[25]](#footnote-25).

As we have confirmed the consistency of the measurement and the structural model, we can rely on the validity and reliability of our data then we can test our hypotheses by probability value (p-value).

The p-Value; is a statistical test, it allows the determination of the significance of obtained results and we use it to test statistically the acceptance of our hypothesis. Its score varies from 0 to 1.

* P-value <0,01 it indicates very strong evidence against the null hypothesis.
* 0,01<P-value <0,05 It indicates strong evidence against the null hypothesis.
* 0,05<P-value <0,1 It indicates low evidence against the null hypothesis.
* P-value >0,1 It indicates absence of presumption evidence against the null hypothesis.

|  |  |  |  |
| --- | --- | --- | --- |
|  | Hypothesis | P Values | Interpretation |
| BPM -> Cost | The BPM implementation lead to cost reduction and saving | 0,027 | Supported |
| BPM -> Quality | The BPM implementation lead to non quality occurrence reduction | 0,000 | Supported |
| BPM -> Time | The BPM implementation leads to time saving | 0,000 | Supported |
| Quality -> Cost | The reduction of non quality occurrence leads to cost saving | 0,000 | Supported |
| Time -> Cost | The time saving leads to cost saving | 0,000 | Supported |

Table7. p value hypotheses validation

This table encompasses the statistical test of the P-value. it is a basis for decision-making regarding the acceptance of hypotheses. All the obtained results are below 0,05 which indicates a strong acceptance of our all hypotheses.

**Discussion and Conclusion:**

This study addresses the analysis of five hypotheses to investigate the relationship between implementing the BPM within the firms and the firms’ competitiveness through the analysis of the level of non-quality occurrence, time and cost saving. All of our hypotheses were accepted that is what enabled us to confirm the relevance of the business process management implementation to process improvement and business optimization as a whole.

The BPM project should be conducted following the right implementation phases to better enable its success and hence guaranteeing it positive effect on firm’s results. What we have seen is that BPM effectiveness and benefit for the firms’ business process organizing and monitoring, of course, selecting adequate business process modeling leads to information availability which is a basis for all the decision-making related to every organizational level.

We have highlighted two primary triggers of the optimization mission. The first one is the most common for Moroccan firms (88% of firms), which is the launch of the optimization mission while detecting non-conformities or dysfunctions, and the second is to launch a voluntary optimization mission (12% of firms). For each one, the benefit of BPM is confirmed and leads to facilitate the analysis of the targeted aspect. As we have found through our data analysis a strong correlation between BPM implementation and time, cost saving and the non-quality reduction, hence we conclude that BPM implementation is time-saving, especially in terms of saving processing time, decision-making time as well as the process synchronization which encompasses the waiting time for processing cycle and time to market. This outcome confirms the effectiveness of implementing the BPM within the firm and hence it supports its positive effect on firm competitiveness.

The second aspect is linked to non-quality reduction which entails three main pillars: no quality of decision-making process, non-quality of the product and non-quality related to the human aspect; that is to say how users behave while detecting non-conformities. The human aspect is actually our main focus; users should stick to process formalism without stifling their creativity. It is to educate the process user to react and handle the non-conformities spontaneously. It is worth introducing within the company the principle “client-suppliers”; where all employees inside the company must require a product that comply with firms’ standards, therefore any non-compliant product will be rejected. In this way, we can limit the non-quality at the early stage inside the company and hence minimizing its related costs and other damages. For the last aspect of this study, it is dedicated to analyzing the effect of BPM on cost saving and reduction. Of course, while analyzing process we can target and eliminate the repetitive tasks, which has a cost and generate time wasting. We can highlight the effect of business process modeling on managing labor costs, machine occupation time and even indirect cost reduction as energy consumption. All of the retained variables cited above are mutually affected positively and our outcome confirms this relation in our context.

In this study, we have concluded that it is beneficial for the company to implement the BPM philosophy to remain competitive and ensure sustainable growth. But it is recommended to devoting much effort to the definition of the firm’s needs, which allows the selection of the adequate BPM tool. This obviously means that we hade designate the qualified staff for managing such a project. It is, then, worth emphasizing that any random choice of BPM tool can leads to this project failure and then generate additional costs for the company.

The results of the empirical research show the positive impact of BPM implementation on firms’ business process optimization. The interest of modeling and monitoring business process has become a key success factor for the enhancement of the enterprise’s competitiveness.

Nowadays, the business process management has become a crucial measure to ensure process organization and agility, it leads to quick supply chain adaptation to the changing context. Business process modeling allows firms to master process responsiveness and to predict its behavior. In a nutshell, the key to coping with change, overcoming impasses in resolving any conflicting situation, and avoiding the cost of broken channels. It becomes an imperative for companies to rely first on their employees’ knowledge, skills and mainly on their commitment to adequately ensure business process modeling in conformance with it strategy. Firms to keep competitive and to maintain it business growing start with organizing it internal structure for the purpose of understanding deeply how are connected and synchronized their processes and then to connect them to it external environment and construct that integrated supply chain thanks to the collaborative supply chain management. It is recommended integrating from the downstream and the upstream it suppliers and clients as it performance depends on it partners performance. We recommend as next steps to ensure a real business agility and resilience within this uncertainty characterizing the global market is to move to collaborative supply chain.

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