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# INFORMATION TECHNOLOGY PAYBACK AND EFFECTIVENESS IN DEVELOPPING COUNTRIES

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## Abstract

*Information and Communication Technology (ICT) needs considerable financial resources. In fact, the ICT environment in developing countries is different from that of the developed countries in many aspects. These differences make the impact of an ICT project failure more harmful than that of a developed country especially at the economic level where financial resources are limited.*

*Organizations in developing countries that attempt ICT transfer often face severe obstacles that hinder their ability to achieve payback from their investment. To understand why this happens requires an investigation into the dynamics between each organization and its environmental context and how that translates into systems that are less than useful.*

*The purpose of this paper is to make the case that ICT payback is difficult to achieve in developing nations unless careful attention is paid to alignment issues in the process of technology transfer, especially issues related to the impact of the environment on alignment.*

*In this paper we present an ICT payback model for developing nations from managers' perspective and then validate it as useful in two ways: that it can be used to explain mismanagement of ICT in developing nations and in its use for the prevention and correction of problems in ICT projects. The model can be very useful for explaining why technology transfer efforts often fail.*

*We developed the ICT management context payback model after extending the integration of previous research on alignment and payback failure, by adding new factors extracted from case studies in developing countries.*

*Keywords: ICT Payback, ICT Effectiveness, Technology Transfer, Developing Nation*

## **1. INTRODUCTION**

The developing countries Information and Communication Technology (ICT) environment is different from that of the developed countries in many aspects. These differences make the impact of an IT project failure more harmful than that of a developed country especially at the economic level where financial resources are limited.

ICT is supposed to help development and prosperity in the developing countries usually through information, knowledge diffusion and sharing. On the other hand ICT development and implementation needs considerable financial resources.

These financial resources are considerable compared to the financial situation in the developing countries. Thus, an ICT payback failure is not a regular problem in those countries from an economic point of view. Companies and administrations in developing countries could not just fix or overcome these types of problems because money is a big issue in this type of economy. Thus, failure in payback is simply considered as catastrophic. So instead of boosting the development, the ICT project will be a disaster on the administration.

In the next parts of this paper, we will try to demonstrate that the ICT payback is a rising problem in developing countries, and then we will try to extract the causes of its failure from previous researches related to alignment and ICT payback.

After that we will present the ICT management context payback model which enables the managers in developing countries to determine and prevent the possible causes of ICT payback failure. The model will be validated through case studies from developing countries.

## **2. THE INFORMATION TECHNOLOGY PAYBACK FAILURE**

An ICT project implementation could only face one of two results: success or failure. Technically, success means that the project is done, that means it's working from a technical perspective.

If we take an example of an information system project in a regular administration, a technical success of the project means that it attends the final stage of the System Development Life Cycle (SDLC). This means that the system is tested successfully and errors are fixed, so it is ready to use with no anomalies.

A technical failure of the project means that the system is not working or simply the development process is stopped due to different causes such as exceeding the budget. A technical failure of a project could also be that the system has a lot of errors and fixing them will be as similar as beginning a new project.

So definitely, a technical failure means automatically a payback failure: if we do not use a system and it's not working, there will be no way that we can get a Return On Investment (ROI). But the question which is worth asking is whether a technical success necessarily means a payback success.

To answer this question, we have to understand that a payback success means that a return on investment is achieved after implementing an ICT project. It means that the increase in the administration financial gain is equal or more than the financial value of the resources allocated to that project.

This definition logically means that in a situation when a project implementation is technically successful, the system is working with no problems; this does not necessarily means that the return on investment is achieved. If we take the example of any information system implemented, if the value added in a financial perspective does not even equal the amount of financial resources allocated to the project, the payback is considered failed. The next model (Figure 1) illustrates this idea.

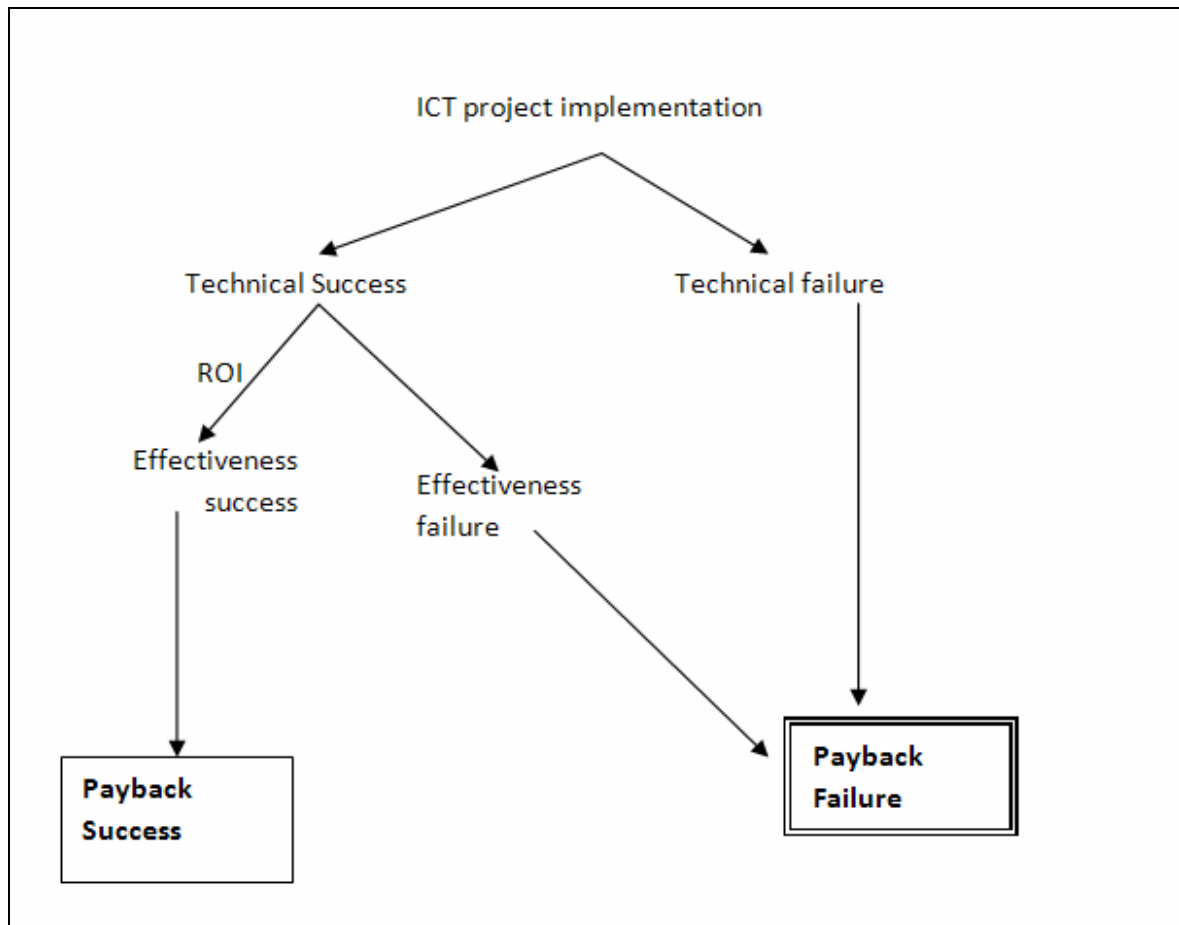


Figure 1. The information technology payback failure

As seen in Figure 1, a technical success of a project is not enough to achieve payback success. In the next parts of this paper, we will show that a complete payback success should be highly considered in the developing countries because of the characteristics of its ICT environment, and that they should not only focus on the technical success of an ICT project.

### 3. CHARACTERISTICS OF THE ICT ENVIRONMENT IN DEVELOPING COUNTRIES

A previous research (Mahfoudhi and Mann 2004), presented the characteristics of the ICT environment in developing countries (Table 1), which represent some of the ICT environment differences between the developed and developing countries. In the next table we will present some of these issues along with the explanations.

Issue	Explanation	Source
Short Term Focus of Government	Short term focus on consumption rather than production results in over dependence on foreign resources	Mbarika et al., 2002, Mockler, et al., 1999
Inadequate Integration of Government Policies	Failure to intertwine ICT policy with other national policies and development of communications standards	Mbarika et al., 2002
Lack of Industrial and Information Infrastructure	High cost, unreliable, inaccessible power and communication infrastructure or when available is only in major cities: 'Information poverty'	Meso and Duncan, 2000
Lack of government funding	Government funding of ICT initiatives is a small part of GDP; large national debt	Montealegre, 1999
Functionality Misfit from Marketplace	Imported systems were developed elsewhere and may not have features that match the local environment (eg: language)	Fagan, 2001
Computer Illiteracy in Employees	Lower supply of knowledge workers in general along with lower demand for them. Literacy issues make it hard for IT and users to communicate. Personnel with some literacy are seen as 'experts'	Heeks, 1999
Computer Illiteracy in Consumers	Only major cities and industrial areas have literacy to any great extent. Foreign ICT is viewed as highly desirable (status)	Heeks, 1999

*Table 1. The characteristics of the ICT environment in developing countries*

These characteristics in the ICT environment in developing countries (shown in Table 1) could play an important role in the technology transfer process. In fact, the lack of government funding problem and the lack of industrial and information infrastructure make the problem of ICT payback in developing countries more intense, because a failure in payback is not likely to be recovered. This situation will just make it harder on the information infrastructure and development in general.

In the next part of this paper, we will demonstrate that the problem of ICT payback in developing countries has a crucial importance, and that it should be analyzed further in order to help developing nations getting the benefit of ICT in development.

## **4. THE INFORMATION AND COMMUNICATION TECHNOLOGY PAYBACK FAILURE IN DEVELOPING COUNTRIES**

The purpose of our research is to prove that ICT payback failure is a rising problem in developing countries to identify the causes and then suggest solutions.

The technical failure of ICT project is definitely a payback failure. To have an idea about the causes of this technical failure, it is worth mentioning that Perkins (2007) noted that over the past 10 years articles has been printed by nearly every major ICT publication to show why large projects succeed or fail. Despite of the availability of sufficient pieces of advice, more than half of the projects still either fail or postpone. Projects fail because they ignore the basic principles of project success that they already know. Among the main reasons for failure are the following (1) an ineffective executive sponsor, (2) a poor business case,(3) invalid business case, (4) very big project, (5) lack of dedicated resources, (6) eyes off the suppliers, (7) unnecessary complexity, (8) cultural conflict, (9) no contingency, (10) long projects without intermediate products, (11) betting on a new, unproven technology, and (12) an arbitrary release date.

The reasons number 1, 2, 3, 5, 8 and 12 are very likely to exist in a developing country as shown previously. Thus, another research (Lippert and Volkmar 2007) mentions the effect of the cultural and behavior differences between ICT users in different environments on ICT effectiveness.

It is shown for instance by Lippert and Volkmar (2007) that the objective behind implementing a new ICT is the integration of operations and the use on common factors such as language, functions and scales across social group (e.g.: nationality and gender) boundaries. The success of this integration can have a profound effect on the functional use of systems to support operations. The need to develop and apply a common metric of technology performance provides a substantial challenge both within and between groups. This challenge is magnified by the differences in value and attitudes among technology users who have different judgments, assessments, and evaluations in their daily utilization of information systems.

But the question that should be asked is whether the situation of ICT implementation in developing countries from success-failure perspective is alarming? The answer to this question is very easy regarding the amount of latest researches developed about three basic points in the developed countries: 1 urgent need to measure payback, 2 urgent needs to achieve payback, 3 decrease ICT investments.

Let us take as an illustration, the example of Joe Seibert CIO from Viacom Inc. which is an entertainment and media company. This example is mentioned by Hayes (2001). Seibert introduced his method for calculating Information Technology (IT) project return on investment which is looked as a big success. Indeed he had developed an IT performance-monitoring process he calls dashboard which drew upon his experience as an accountant, software developer and consultant. Line managers and divisional CFO's like Seibert's method which prove IT projects value at a time when there is an urgent need to control costs. Few companies are able to monitor ROI the same way as Seibert system does."*Although in the frenzy to cut costs and justify every penny spent, many CIOs are returning to tried-and-true metrics for determining ROI. Approaches and results vary widely, but ROI has re-entered the lexicon of senior executives in a big way, and it is putting pressure on IT to prove the validity of projects.*"(Hayes 2001).

The need to measure IT payback was not an urgent need in the past, but the current world economic situation is pushing managers to justify any investments especially in IT where it needs big financial allocations.

For instance, according to King (2002), if we ask 10 IT leaders the way they measure payback on their firms' technology investments, you will have at least 10 different answers. If you are fortunate enough, their replies will contain a common theme. Apart from how they measure payback or what financial formulas they apply, the slumping economy makes them under big pressure to show bigger and better returns faster. This situation pushed managers to focus more on payback of IT projects.

From Mullen's point of view (Mullen 2001) the days of neglecting ROI are over as system suppliers and users say. Moreover, chemical producers are investing in smaller projects and watching closely the payback. For instance, chemical companies are reducing budgets by canceling projects.

Moreover Lewis (2001) shows that many companies are putting CIOs on a short restraint especially when the economy remains slow-moving. They are demanding proof of payback at each juncture of IT projects, requiring CIOs to add financial expertise to their technical and business repertoires.

Lewis added that a heady economy could hide the failure of Enterprise Resource Planning (ERP), chain management, sales forces automation and other big IT projects.

All of these facts show that IT was not paying back and it was inefficient. So if this is the situation in a developed country, how about the developing countries where the context of ICT implementation is worse? The factors and reasons behind this failure of payback and effectiveness in developed countries are definitely more intense in the developing countries. The situation of payback and effectiveness even if it's not studied or alarming in developing countries but at least what's happening in developed countries is enough proof that the problem is serious, especially when there is no evidence that it's getting better, proved by the intensions of more decrease in ICT investments.

The ICT payback problem in developing countries is surely a rising problem. Even if it's not directly evocated, this problem is seriously threatening the ICT initiatives and expectations. Developing countries are in a real need for development, so if resources will be allocated to boost the development, a failure of payback is dramatic.

But the question is what are the real causes or factors that lead to this ICT payback failure? Are there specific ones related to developing countries? In the next part of this paper we will try to highlight previous researches on the causes of payback failure.

## **5. THE ALIGNMENT ISSUE**

Previous research presented as the Organizational Alignment Framework (Mann and Rohatgi 1998) shows the importance of the alignment and the synchronization of different components of an organization for the purpose of high business performance. The framework demonstrates that an organization is made up of many components including its culture, structure, technology, etc. These components need to be working in a synchronized fashion so that the whole organization can move in the same direction. High performance is often prevented because one or more components are working at cross-purposes. Therefore before new implementation can occur ICT should be aligned with other organizational components in order to be effective.

Thus, a major concern when transferring ICT into an organization in a developing nation should be on aligning it with all different organizational components to ensure that the technology chosen effectively supports the other components. This issue has important ramifications for the governments of developing nations. If the government of a developing nation wants to improve the ability of a domestic firm to successfully align ICT to the other organizational components, then it is important for the nation to understand how the environment impacts ICT choices that a firm makes.

In the next part, the ICT environment context of a developing nation that should be considered when implementing new ICT is presented in the ICT Payback Model.

## 6. THE ICT PAYBACK MODEL

The ICT payback model which was presented in previous research (Mahfoudhi, Mann 2004) is used to connect the environmental context issues to payback failures in firms. In this paper we will extend the model by focusing on the management context issues to payback failure.

The ICT payback model (shown in figure 2) has three basic parts:

- The characteristics of developing nations within environment that impact the successful transfer of ICT into the firm (Environmental Challenges: Computer Illiteracy, Marketplace Inadequacies, Inappropriate Government Policies, Lack of Funds and Lack of Infrastructure).
- The intermediary ICT obstacles that arise from the developing nation environment (ICT Obstacles: Mismanagement of ICT and Low Organizational Buying Power).
- The final ICT issues that directly influence payback in a negative way (ICT Weaknesses: Wrong System Built/Chosen, Lack of System Integration and System Usefulness Diminished).

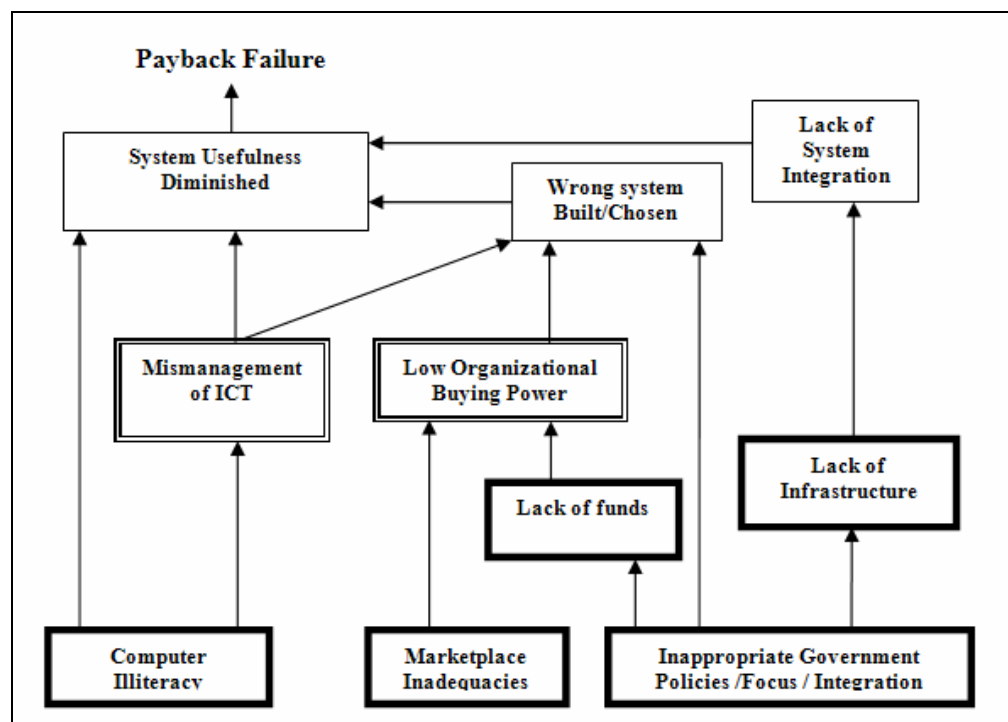


Figure 2. ICT Payback Model in Developing Nations

The model has different levels presented by different borders:

- Dark Solid Border = Environmental Challenges in Developing Nations
- Double Line Border = ICT Obstacles
- Normal Border = ICT Weaknesses

To summarize the model, environmental factors in developing nations create obstacles to successful alignment that result in the selection of inappropriate ICT solutions and this causes a reduction in usefulness leading to a negative payback for the ICT implementation. If ICT payback is a major objective of an ICT implementation, then considering the differences between developing and developed nations economically, socially and culturally becomes an important exercise.



## **7. EXTENSION OF THE PAYBACK MODEL**

The ICT payback model explains the different factors existing in an ICT implementation environment, from government policies to user behaviors. But what is the responsibility of ICT project managers in this matter? What are the causes directly related to mismanagement of ICT? What are the mistakes that could be avoided by managers?

If we will try in this paper to propose the end solutions to the problem of ICT payback in developing countries, we have to propose something realistic that could be applicable. For example, it is not reasonable to propose a solution which is out of the hands of managers, like leveraging the purchase power in a nation. Previous research (Faiz et al 2005) suggested some technical solutions as using WebServices as a tool for ICT effectiveness, but in this paper our objective is to determine measures affordable by managers before and after the implementation. So what are the mismanagement actions that should be avoided or controlled?

To answer this question, the methodology we adopted is to extract the factors mentioned above through case studies in developing countries. These case studies could be very useful to get us close to what is really happening in the case of ICT payback failure in developing countries.

## **8. IMPLEMENTATION CASES IN DEVELOPING COUNTRIES**

### **8.1 Case of Telemedicine (Tunisia)**

The telemedicine has started in Tunisia from personal initiatives to be then structured in projects submitted to the Technical Committee of Telemedicine. It was created by order of the Public Health Minister on May 15th, 1996. It is a consultative technical committee chaired by the Health Chief Executive Officer, whose vice-president is the General Manager of the CIMSP (Public Health Ministry Computer Science Center) and the secretarial department which is assured by the CIMSP.

Since its creation on January 3<sup>rd</sup>, 1997 the telemedicine technical committee has held 12 meetings till 17/12/2002, the main decisions taken were recorded in the entitled document "The telemedicine committee decisions".

In fact the sites of telemedicine are 25 and required an investment of 720136, 400TDN (Tunisian Dinars) on the budget of the Health Ministry. This investment does not include equipments and software acquired within the framework of the cooperation.

Moreover, there are 13 sites of Teleradiology among which 12 are with video conference, 3 of Telepathology with video conference, 2 sites are specific to the Ophthalmology and 7 allowing only the video conference.

For instance these sites of telemedicine are settled in 8 CHU (University Hospital Center) (Charles Nicolle, Rabta, Aziza Othmana, Habib Thameur, Mongi Slim, Razi, Farhat Hached, Habib Bourguiba), 5 specialized centers (children's Hospital, Salah Azaïz, Neurology, Othopédie Kassar Saïd, Opthlamologie Hedi Raïs), 5 regional Hospitals (Kef, Jendouba Mahdia, Gafsa, Gabès).

The communication supports used are:

- The digital network with integration of service (ISDN) in 17 sites
- The satellite 3 sites: the Rabta hospital of Tunis and Habib Thameur hospital (besides the ISDN), the Razi hospital of Mannouba.
- The Internet: 5 sites.

### 8.1.1 *The assessment*

The following assessment is confirmed by the conclusions of the strategic study elaborated by the Spanish research department INDRA.

It shows that the use rate of the telemedicine stations is weak and some stations have entered a real phase of exploitation. It shows also that the telemedicine projects developed in Tunisia are experimental type. It seems that the research is propelled by powerful engines but of limited period. It depends on the interest, the personal involvement and the enthusiasm of the professionals and not the institution.

INDRA also concluded that there is weak functional telemedicine integration in the health system. According to it, the telemedicine is perceived as a prestige technological appendix and not necessary for sanitary services.

The reasons of this weak use of the telemedicine stations can be imputed to 3 factors:

- The absence of an organizational and legal frame (executive) allowing governing the telemedicine sessions.
- The absence of a real will of collaboration between the doctors using the telemedicine stations.
- Technical problems concerning the communication lines, equipments and software certainly exist, but they cannot hide by themselves problems of organization and voluntary service in this type of activity. It should be indicated that there is no maintenance contract established for these projects.

So the weak use of the telemedicine equipments recovers essentially from a closing down of the users. It is a problem of voluntary service and contents.

### 8.1.2 *INDRA urgent recommendations*

- Update the evaluation of 25 sites of telemedicine and gather the telemedicine committee to review the situation identify the reasons of the dysfunctions and suggest solutions. During this meeting the people in charge of the telemedicine projects will be invited to present and to submit an activity report of their Sites according to a model which should be given to them in advance.
- Define an organizational and legal frame and a working charter for the user doctors.
- Establish an action plan aiming at a material and software enhancement of the telemedicine stations and maintenance contracts for all the stations.
- Make profitable the existing telemedicine infrastructures even if we need redeployment.

### 8.1.3 *The payback failure*

Telemedicine is the technology that provides medical expertise sharing between doctors. Doctors then could share their opinions about different patient cases through multimedia network support. This information technology is intended to be a decision support tool for doctors and a communication facility.

After interviewing some of doctors involved in this project, we found that different doctors working in public hospitals suggested the Telemedicine project to the authorities in the public health ministry. Meetings were continuously organized and the project was considered to be studied with a preliminary approval.

What happened next is that the responsible took a long time to start up the project because of traditional bureaucracy in such establishments.

At this point this situation is considered to be type of ICT implementation barriers, but what happened next shows us how these barriers turn to be a barrier for ICT payback after implementation.

Different public hospitals then pressed by the need and attraction of the Telemedicine idea didn't wait for the ministry to intervene, so they took their own initiatives and start different types of Telemedicine projects from ICT perspective on their own.

The different projects were managed by doctors who are not of course ICT experts which caused complete failure from payback and effectiveness angle.

The failure was clear after the unwillingness to use the system by the different doctors for two major reasons:

- The price of telecommunication is relatively expensive which discouraged the doctors to use the system.
- The doctors found themselves unwilling to share expertise and information for pride causes.

The first problem could be avoided if the ministry ICT experts did their jobs and expected the growth of Internet and advised the doctors to rely on it for their project.

The second problem is a cultural problem that needs to be analyzed further.

We understand from the telemedicine case that mismanagement of ICT because of bureaucracy and because of computer illiteracy added to cultural problem were the main causes of ICT payback failure.

We can sum up that in the following figure:

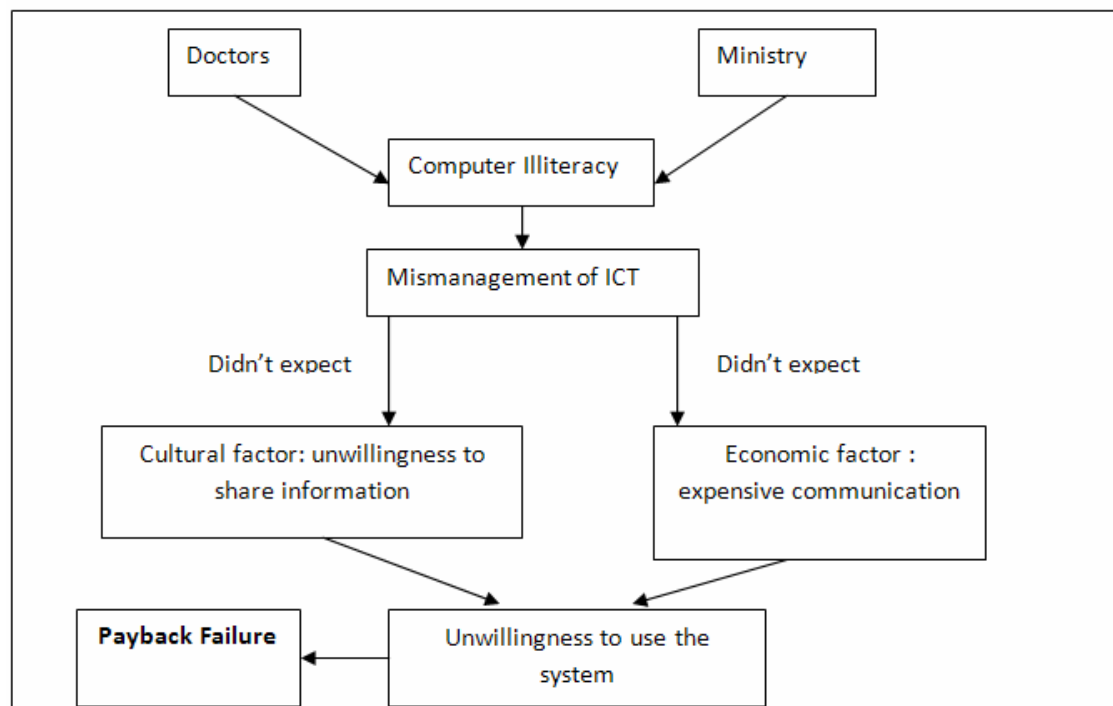


Figure 3. The payback failure in the telemedicine case in Tunisia

The ICT managers in this case should expect the economic and cultural factors so they can cancel the projects or find solutions instead of paying hundred of thousands of dinars with no payback.

## 8.2 Case of ALQasseem University (Saudi Arabia)

The AlQasseem University used to be a branch from King Saud University until 2004 then the King of Saudi Arabia decided to create an independent university in AlQasseem province.

The Information System of AlQasseem University used to be King Saud Information System then the University administration found itself obliged to build their own, otherwise they will face a tremendous renting fee estimated at 300.000\$ a semester. The project was delivered to an ICT company based in Saudi Arabia. In a year the information system was ready and the University administration pushed very hard to start the second semester of the 2005-2006 academic year with the new system. The information system was composed of three different sub systems: the student information system (registry, courses...), the financial information system and the human resource information system.

In the beginning of the new semester, the new information system started to run with no trial phase. Consequently, the result was a big disorder and failure. For instance, students could not register in the system for almost three months and classes were postponed three weeks to start.

This should be explained by the existence of too many errors in the system which prevents the users to use it.

Moreover it should be noted that the problem in this case was not only technical, the mismanagement factor was very present. In fact the administration should provide a trial phase agreement with the ICT Company. The project was also too expensive (3 million dollars), this situation could be prevented if at least the faculty staff in the ICT department were consulted.

So we could summarize the problem in the following figure:

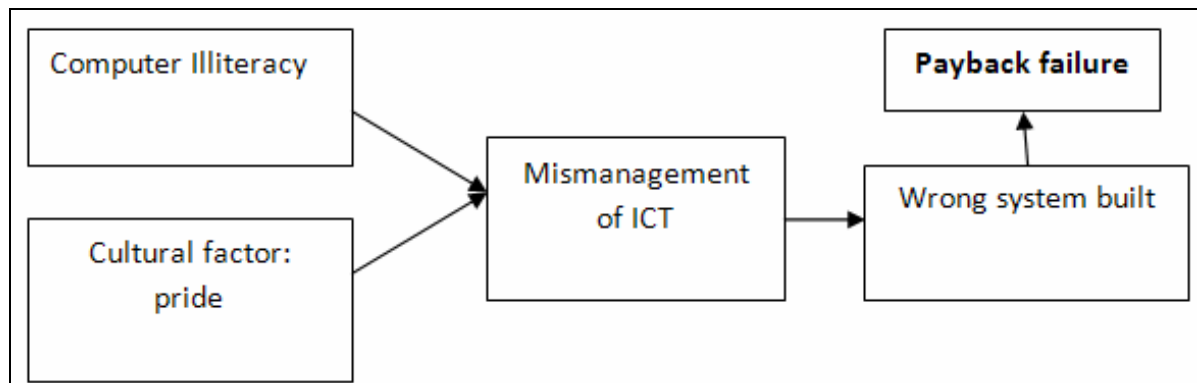


Figure 4. The payback failure in AlQasseem University

The computer illiteracy factor of the University administration in term of ICT project management, and the cultural factor that prevented them to consult the faculty members, were the main causes of the payback failure.

### **8.3 Case of Tunis municipality (Tunisia)**

Tunis municipality started a website in year 2000 designed as a support for taxes e-payment. What happened is that few citizens used that facility to pay their city taxes for almost three years to find themselves after that facing the court of law for non payment.

The simple cause was that there was no communication between the web server database and the municipality internal information system database.

The explanation of the reasons of this failure was clearly a mismanagement of ICT. In fact the ICT experts in the municipality didn't bother themselves to try the system for a traditional trial phase, no follow up was conducted which was commented by a municipality executive that the whole project was initiated for propaganda purposes.

## **9. THE ICT MANAGEMENT CONTEXT PAYBACK MODEL**

To manage any project, manager's behavior is the success key of the operation. There is a bad intention behavior and a good intention behavior.

The bad intention as seen in the previous cases is one of two types. The first type is that the managers want the project to be a propaganda tool especially in the public sector where the manager's nominations are most of the time political. The second bad intention in manager's behavior is just corruption, which is one of the worst factors in ICT payback failure. Corruption simply makes the managers careless about the quality, the budget and the use of the ICT implemented which directly lead to payback failure.

There are also bad or mismanagement acts that could be non intentionally indirect causes to payback failure. A good manager behavior does not prevent mismanagement if other facts are not considered.

The first problem is alignment. If managers do not care about aligning ICT project to organizational factors, there will be a big user resistance due to cultural and economic reasons. Culturally, the new ICT is most of the time presented to users in a foreign language which increase the computer illiteracy problem of users in developing countries. Users respond less to a system when they face a language problem which pushes their resistance to it.

Another cultural fact is that users generally resist to a new ICT when they fear losing power in organizations. Economically, users resist also when they fear losing their jobs. If this new ICT for them risks their positions, they will definitely resist or may be sabotage it. So if managers do not intend to align the new ICT with these organizational factors, an obvious payback failure risk is existing.

A good intention behavior of managers can not do much thing when it is associated with computer illiteracy of managers themselves. In fact, managers who are ICT illiterate are known of their information diffusion fear in the organization. This is considered as a cultural resistance to new ICT. They often do not care about the system analysis and design phases which could lead simply to technical failure. It also leads to complicated user interface that could often lead to user resistance to use the system.

The following model illustrates then all the previous factors that should be considered by managers in order to succeed with ICT projects in payback perspective.

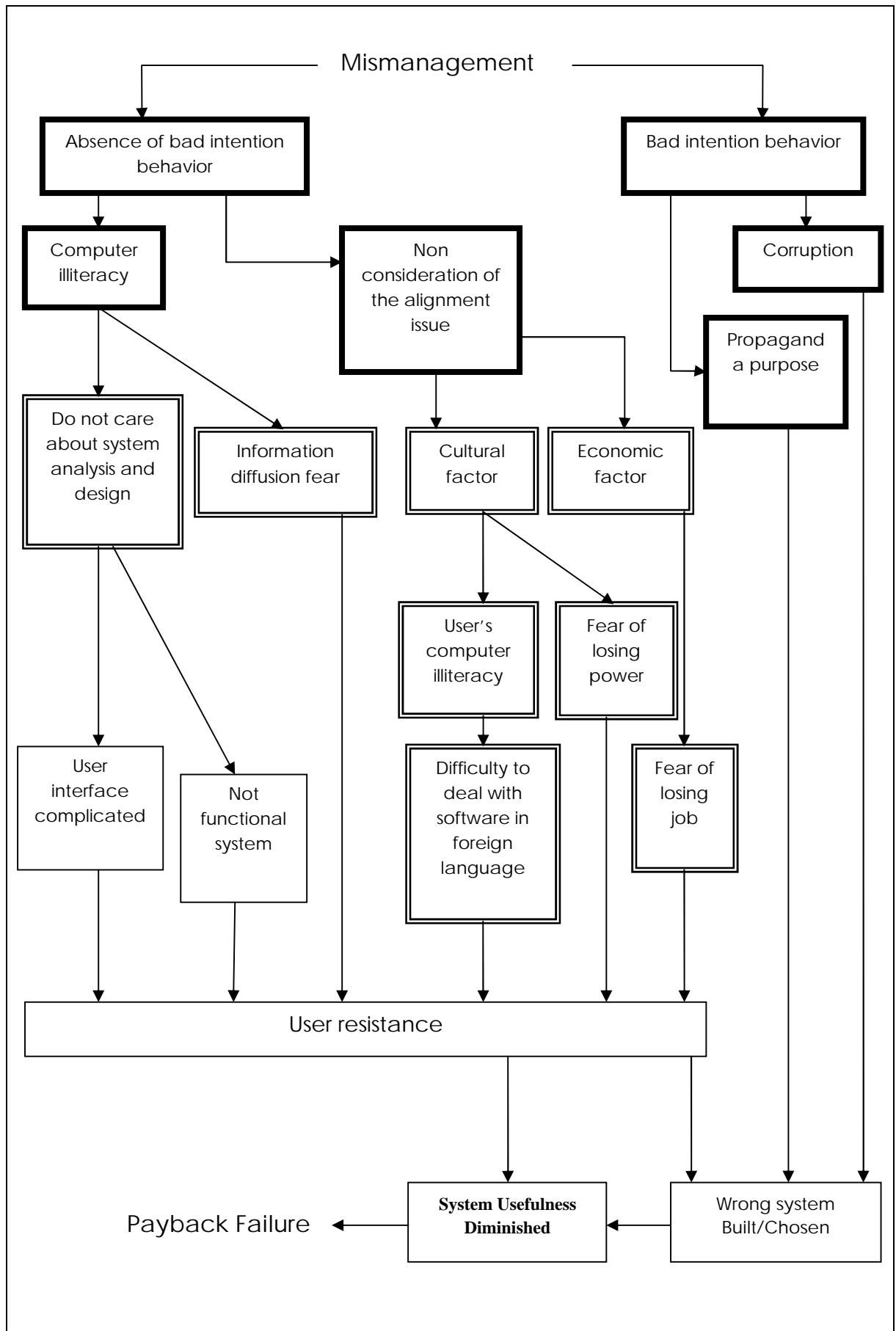


Figure 5. The ICT management context payback failure model

The model presents different levels presented by different borders:

- Dark Solid Border = Environmental Challenges in Developing Nations
- Double Line Border = ICT Obstacles
- Normal Border = ICT Weaknesses

## 10. CONCLUSION

Payback of ICT projects is a rising problem in developing countries which can not afford failure from the economic point of view. The realistic solutions to this problem are in the hand of ICT managers who once getting the attention to the factors and obstacles that prevent ICT payback could act in order to improve success.

In this paper we tried to present a model that should help managers to attend that goal which is to understand the real obstacles that face them to success. Many of these obstacles are specific to the developing countries ICT environment, so managers should pay more attention to alignment issue when implementing new ICT projects.

The managers should also improve their Information Technology (IT) management skills which include systems analysis and design theories. In addition to that, organizations in developing countries could play a positive role by educating managers on the different issues related to the ICT environment.

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