



Qualitative Analysis of the Innovative Knowledge Creation Style of Project Managers and its Relationship with Performance Stability in IT Projects

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Abstract. Innovation is the backbone of the information technology industry. IT projects are creating new innovative knowledge and are targeting successful performance. This is a qualitative study applied on the project managers in the IT sector to describe the relationship between the innovative knowledge creation and the stability of the IT projects' performance. The study is applied on different project managers from the middle-east zone and is focusing on the description of the characteristics of the innovative project manager of information technology projects. The research also classifies the performance of the IT project into stable and nonstable one. It deals with the cases in which the instability of the IT project performance is accepted by the innovative project manager. It also deals with the role of innovation in stabilizing the project performance. The project performance differs qualitatively from organization to another. One of the factors that are describing these difference is the complexity of the IT project. The study also is contributing to the body of science by designing a conceptual model for the relationship between the innovative knowledge creation process and the stability of the IT project performance. Projects are classified into high complexity projects and low complexity ones based on four dimensions; the size of the project, the interdependency level of the project with other projects, the environmental complexity of the project, and the system variety of the project components. The relationship between innovation and risk averse tendency is discussed as well in this research. Narrative and systematic analysis of the respondents' stories are detailed and linked to the IT project performance. The stability dimensions of the IT project performance are described by four dimensions which are the quality of the performance, the time, the cost, and the productivity of the innovative project manager.

Keywords: Innovative knowledge creation, performance stability, IT projects.

1. Introduction

The information technology sector is one of the rapidly changing sectors because it depends highly on technological changes. These changes are sometimes radical and sometimes are dangerous and demands rapid response from the manager's side. The manager of the information technology projects needs innovation in his work. There are many studies in the literature that shows the need to have innovative project managers to be able to cope with rapid changes and to survive in the marketplace. Geraldi (2009) highlighted the role of flexibility of the manager to introduce changes based on the changes in the customer's needs and wants. Wang (2010) explained how ambiguity of the needed knowledge affects adjustments of standards. These adjustments lead to the need to more flexibility in changing the structure, schedule, and budget of the project (Batra, 2010). Burness (2004) assured that the availability of innovative performance is important to the success of the organization. This importance increases when there is high frequency of randomness and irregularity in control charts of production (Briggs and Peat, 2000). Sometimes this randomness is unpredictable, and this unpredictability is frequent (Burness, 2004) and this increases the importance of having innovative style of project managers. The problem of unavailability of knowledge to raise the level of control was raised and studied in the body of knowledge (DeMeyer, 2006) however; the focus on innovation as a style of

knowledge creation was not covered by enough research. There is a relationship between the need for innovative project managers and the higher levels of change and chaos in the project performance (Xsun and Cheng, 2012) and this increase the importance of shedding more light on the role of innovative project managers in bringing stability to the rapidly changing performance of projects especially if we knew that the previous research found that there are high levels of forecasting future performance indicators in projects management (Tolentino and Ruiz, 2015). This study is an attempt to describe the relationship between the innovative style of the project manager and the stability of the project performance in a high complexity environment. This paper starts with a brief about the literature review, then seven qualitative research questions are narratively and systematically analyzed to investigate the importance of having innovative project managers. New constructs were found through analysis. The research contributes to the body of knowledge about the reasons for which the project manager is willing to accept certain levels of instability in the project performance. The interaction between the level of project complexity and the level of its performance instability is also analyzed systematically. Qualitatively the effect of complexity on the performance stability is discussed and factors of controlling this effect are discovered and summarized in this research. The conclusion part of this paper is about the effect of innovative project managers on the different dimensions of the project performance like quality, time, cost, and productivity.

2. Literature Review

New knowledge is related to innovation (Leonardo, 2011) and this forces investors to believe in depending on intellectual properties to achieve innovative performance (Berkeley, 2010). Practically this is not easy on the project level. The scope, time, and, cost of the rapid changes is not easy to change. Berkley (2010) believed in high sensitivity and in finding quick changing plans for unexpected changes that this has very low probability to be repeated in the future. Secrets of success are copied quickly so it is better not to repeat it even if it led to success. The tendency to innovate is not optional for project managers nowadays. It is mandatory because of the chaotic future changes and expectations (DeMacro, 2006). This is supported by the findings of Linstone and Turoff, (2010) who believed that innovation leads to better adaptation with chaotic changes in performance and better competition. One of the main characteristics of the innovative managers is the dominance of using tacit assets more than explicit ones for creating new knowledge (Yi and Baizhou, 2013). Innovative project managers consider that the competitors are the main and the most important source of creating new knowledge (Yi and Baizhou, 2013). The new knowledge for projects and for better competition depends on having innovative human assets in the project or in the organization. (Berkeley, 2010).

3. Research questions

Around the importance of having innovative project managers the researchers were able to design a qualitative study that includes the following interview questions:

- Q1. How does the new knowledge creation affect your project's performance?
- Q2. How does innovating ideas affect your project performance?
- Q3. Which one is more important to have low risk project performance or to have innovative project performance?
- Q4. Do you consider the performance of the current project a stable one and why?
- Q5. What are the main reasons behind the instability of the project performance?
- Q6. In which aspects of the project performance do you as a project manager accept instability?
- Q7. What is the level of complexity in the IT project? How does it affect performance stability? And how to avoid that effect?

To be able to answer these questions the researchers interviewed 50 IT project managers from different countries in the Middle-East zone and narratively and systematically analyzed their answers.

4. Results and Discussion

In the following lines the researchers summarize the main results of the study.

How does the new knowledge creation affect your project's performance?

Project managers said that Knowledge about the market helps in developing and innovating new mechanisms of performance. New knowledge creation always has a positive effect because it is a source of creative ideas about how to implement the project. They believe that this depends heavily on the size of the project and whether it is big or small. The results of creating new and innovative knowledge are better planning and goal setting, achieving satisfactory results by the end of the project, better testing, higher accuracy of estimation, and increasing the quality of the technical work. The following table shows the grouping of the project managers' responses under three constructs:

#	New constructs	Project managers' responses
1	New market opportunities	<ul style="list-style-type: none"> • When you create new a knowledge, you create new projects in the future. • It helps in better estimation for future variables • Leading to further knowledge creation and contribution to the success of the project.
2	Increasing trust	<ul style="list-style-type: none"> • It enables you to trust the right people. • When we use the test automation, this enables us to test and estimate efforts by 50% accuracy. • It helps in better estimation for future variables. • Anything I don't understand is a new knowledge for me. • Leading to further knowledge creation and contribution to the success of the project.
3	Easiness of processing	<ul style="list-style-type: none"> • New knowledge helped me in the selection of resources. • It eases the next phases of the current project. • It makes future projects easier. • For example, dealing with a new tool, or a new team member in any project phase is considered as a creation of a new knowledge.

Table 1. New constructs of the effect of new knowledge creation on the project performance

As a conclusion in this part the new knowledge creation in general is found to be considered as highly important by the project managers in the IT sector because of three main reasons; it opens new market opportunities, it increases trust, and it leads to easiness of processing.

How does innovating ideas affect your project performance?

Innovative project managers consider the instability in the project performance as something positive that leads to better opportunities in the market. Innovative knowledge creation is used in problem solving and creating new solutions. Many problems can't be resolved unless you think out of the box. Innovation is important basically in the vertical experience of the project manager not the horizontal one. Vertical experience is the one that enables the project manager to grow vertically though out upper levels in the career path. Innovating something new gives unexpected results which is good for the project and will add new engineering ideas and modern innovative standards to the project. Innovation enabled project managers to propose a new structure for the technical guide and this made it easier and faster to be understood and this caused a decrease in the number of technical mistakes in project performance. The effect of innovation on the project performance is positive because innovation increases the technical value of the project. Sometimes project managers face problems in the deployment duration or any other problems that may affect their customers. They work by batches of sites and they need to make the site and then work on air on the project, so they may face many problems. Innovation helps them to solve these problems and meet customers' expectations. Innovation may affect the project performance positively by affecting the functioning of the project, time, and cost of the project. Innovation helps in achieving goals faster than working without innovation. Innovation helps in changing the method of implementation to save time. Interviews revealed 5 groups of variables as shown in the following table.

#	New constructs	Project managers' responses
1	Market opportunities	<ul style="list-style-type: none"> • Innovating something new increases customer demand and expands the business in the market. • If the project implementer is innovative this can be enough to satisfy the customer. • Innovation enables the project manager to gain the customer confidence that we are always able to find solutions • Sometimes we face problems in the deployment duration or any other problems that may affect our customers. We work by batches of sites and we need to make the site and then work on air on the project, so we may face many problems. Innovation helps us to solve these problems and meet customers' expectations.
2	Feeding managerial processes	<ul style="list-style-type: none"> • Innovating something new gives unexpected results which is good for the project and will add new engineering ideas and modern innovative standards to the project. • Innovating ideas increases organization • Innovation facilitates the implementation of the project • Innovation leads to expected results like better work performance reports • Innovation leads to better competition among workers to innovate something new • Innovation is reinforcing more competitions among workers and creating a rewarding system for innovators. • Innovative ideas help a lot in solving some issues. • Sometimes there is no need to go to a developer because we have innovation. • Innovation helps in achieving goals faster than working without innovation • Innovation is important basically in the vertical experience of the project manager not the horizontal one. Vertical experience is the one that enables the project manager to grow vertically though out upper levels in the career path.
3	Sources of innovative knowledge	<ul style="list-style-type: none"> • Communication in all directions increases the ability to get great and innovative ideas, like for example having suggestions box. • We must listen carefully and focus on all new ideas.
4	Time for creating innovative knowledge	<ul style="list-style-type: none"> • Innovation is not preferred during implementation. • It may be managed while planning the project. • Innovation helps in changing the method of implementation to save time.
5	Effects of innovative knowledge creation	<ul style="list-style-type: none"> • Innovation helps in the process of test automation • The development of routine procedures heavily relies on innovation and new ideas. Before any routine there was innovation • Innovation helps in thinking out of the box, finding alternative solutions, and conducting deep analysis. • Innovation may affect the project performance positively by affecting the functioning of the project, time, and cost of the project. • Innovation enabled us to propose a new structure for the technical guide and this made it easier and faster to be understood and this caused a decrease in the number of technical mistakes in project performance. • The effect of innovation on the project performance is positive because innovation increases the technical value of the project. • Innovation saves time and cost for the project manager • Innovation helps in achieving goals faster than working without innovation • Sometimes we face problems in the deployment duration or any other problems that may affect our customers. We work by batches of sites and we need to make the site and then work on air on the project, so we may face many problems. Innovation helps us to solve these problems and meet customers' expectations. • Innovation helps in changing the method of implementation to save time. • It does not affect project performance!!!!

Table 2. New constructs of the effect of innovating new ideas on the project performance

As a conclusion of this part we can think of the effect of innovation on the project performance by focusing on five dimensions. These dimensions are what market opportunities can be created by this

innovation? How this innovation can feed the managerial process and its success? What are the sources of innovative knowledge for the innovative manager? What is the best time to create innovative knowledge? And what are the main effects of innovative knowledge on the project performance?

Which one is more important to have low risk project performance or to have innovative project performance?

The risk averse project managers feel comfortable when they are able to know about risks before starting the project and they think that this increases its percentage of success. Risk averse style is relatively more focused on minimizing the level of risks and hence can create clearer vision in the light of what abilities and skills he or she has in their projects. They tend to believe that innovation requires extra time and may become an obstacle for project completion on time. They believe that risk averse is more important than innovation for the project success because any project has many risks related to aspects like changes in the dollar price, changes in the number of workers, and scarcity or unavailability of resources. Risk averse managers think that these issues must become a first priority for project managers to be able to have successful project performance rather than thinking of something new and innovative. Putting issues like currency, workers, and resources in the first priority from their point of view will increase their ability to minimize risks of their projects. Risk averse project managers define the good project manager as the one who can minimize the risks and submit on time. If the client knows that they are trying innovative things for the first time this may affect his or her trust and this is risky according to the risk averse style managers. Geographic location and the cultural norms and traditions of the hosting country will differ and accordingly the levels of risks will differ because it is strongly related to complexity of the project context.

The innovative knowledge creation style managers think that lots of minimization and avoidance of risks will limit the achieved results and will limit the growth. They believe that the innovation itself is indirectly a reason for minimizing the project risks in the future and that without innovation the risks might be increased, and growth will be threatened. Innovation does not succeed unless there is a base for it and that this base is made up of the regular and standardized plans and procedures of the project. Otherwise the innovation without this base becomes a mess. The more innovation we apply in our projects, the faster we can finish it before its due date. Trying new things is risky and costing extra money on the short run but on the long run the returns on investments are higher. There is no need to focus on risk avoidance. It is consequently achieved through perfect management. Sometimes there are delays in the due date, however; the customer is satisfied with the results because it is unique and innovative. This adds to the belief that it is more important to innovate than to minimize risks. The focus on the minimization of risks will hinder the ability to have new customers in the future. They feel that innovative results are more important to the customers than ordinary ones and even more important sometimes than delivering the project on time. The project implementation will become easier and more successful by having innovation knowledge creation rather than having the risk averse knowledge creation.

Do you consider the performance of the current project a stable one and why?

Then we come to the qualitative analysis of the innovative style of project managers. They believe in the principles of quality and that the work and the performance need to be continuously improved. They said that the stability of the project performance depends on the quality of the project plan. This plan is improved project after project and is not repetitive for similar types of projects. The improvement of the plan leads to what they call the proper planning and this proper planning leads to higher levels of performance stability. They start using innovation in the early stages of the project which is the stage of setting the plan. They use the other members in their teamwork and the suppliers as sources of improvement ideas for better and innovative performance that distinguishes their company and give it superior competitive advantage over other competitors in the eyes of their customers. These innovative project managers are not against change and they accept it. They depend highly on the change management department to support in controlling changes that occur during implementation. This control may happen by trying new methods in the implementation and/or introducing new standards in the plan. They are ready to change or to react to needed changes and by this readiness they have stable performance. They clearly said that there is a stage of instability that usually happens early at the beginning of the project. At this period there are some changes in the plan until the project manager feels that the customer will be satisfied by the end of the project. The customer demand and expectations are the drivers of the needed change at the beginning of the project. They take longer periods of time in the planning process compared to other styles of the project managers. They highly depend on regular meetings with their customers and they are willing to change based on the customer feedback. If there is contradiction between the official time schedules and the customer requirements, then they change their

schedules to respond to their customers even if this leads to delays in the completion of their project. They are willing to change items in their contracts if it leads to higher levels of customer satisfaction. When it comes to the customer satisfaction they are willing to change the control limits and find innovative solutions and try it for the first time and this means that they are risk takers. This interprets why some project managers take longer periods of time to finish their projects and even higher costs than the planned costs but at the end the project is a success.

What are the main reasons behind the instability of the project performance?

In this part we will relate the reasons of instability of the project performance to innovative knowledge creation style of project managers.

This style of managers is concerned with the collection of data from all possible sources and is open to new knowledge and change. If the requirements of the project are not clear, then the innovative managers are not sure about the data they need to collect and the knowledge they would need to create to stabilize the project performance. The unclear requirements may also affect the planning process. They prefer to continuously improve the quality of the created knowledge during different stages of the project life cycle. They use main resources then sub-resources, and maybe sub-resources and sub-sub-resources to improve the knowledge creation process. They said that on the long run the knowledge creation is a key to the customer satisfaction, marketplace competitiveness, and building a history of success that leads to stability of future projects' performance. The innovative project managers expose their innovative ideas to different stakeholders and communicate it to improve it and innovate better ideas and more stable ones that are more able to achieve the project stability and success. The clarity of the project scope and what exactly is required by the completion of the project is enhancing this stability and the direction of innovation. The project managers innovate in the light of the scope of the project and it helps them to implement the project using new techniques and methods. Innovation leads to less costs and higher profits, or when the innovation leads to simplification and speed of implementation. This style is the best one to deal with the change in the scope because the innovative project managers tend to accept change and are open to it relatively more than the other styles as found qualitatively. The innovative project manager considers misunderstanding the client expectations as one of the main reasons behind the instability of the project performance or even the main reason. Moreover, that the innovative project managers think that they should learn about the internal cycle of the clients' organization and work and that this learning will lead to higher capabilities to achieve higher levels of stability in the project performance. Without enough information about the client and his expectations, the project manager will not be able to perfectly create the right innovative knowledge that leads to the optimum stability levels and the highest rates of customer satisfaction. The human assets are main components of this process. They are the inputs to the innovative knowledge creation process and they use its output as well. The innovative project managers collect information and data from the human assets, and not only that, they also prefer to work with innovative workers to enrich the creation of innovative knowledge. If the workers feel that their innovative ideas are rewarded and appreciated, then they will participate in making it happen and succeed. This encourages them to speak loudly about their mistakes and problems as opportunities for improvement and innovation. They believe that innovation includes the implementation of created ideas to check if it will work or not and to improve it in its contexts. To be able to do that they use many tools and techniques like simulations and functional deployment before implementation to be able to control the cost and the stability of the project performance. The innovative project manager believes that the inaccurate surveys will definitely lead to the instability of the project performance later on because it is an input to the innovative knowledge creation.

In which aspects of the project performance do you as a project manager accept instability?

Do we consider the instability in the project performance as a negative indicator all the time? After conducting this research, we found that there are certain cases where the project manager is willing to accept the instability in the project performance. The following table summarizes the external and the internal reasons behind accepting the instability in the project performance.

Accepting instability due to external reasons	Accepting instability due to internal reasons
Increase in the price of the main resources of the project.	Lack of experience for some employees.
Conflicts with customers about finishing touch of the project.	Delay of needed financial resources.
Lack of suppliers' commitment.	Mainly having problems with the human resources management.
We face instability in the availability of clients in the market (end user of the project). This never exceeds 10% of our estimations.	Delays in project implementation and not being able to submit in the planned due date to the customer.
Low number of customers or no customers affects the performance of our projects in general.	
Instability is mainly found in the availability of resources for the project and this instability may represent 20% deviation in the plan.	The escape of some team members may represent a source of instability and we can afford the escape of a maximum of 30% of team members and are able to manage it.
We have instability of about 5% in the availability of resources.	
We accept instability that is represented by changes in the project resources.	
We accept instability that is represented by changes in the project scope.	At the beginning of the project during the initiation stage we accept 20% of instability in the performance indicators and this percentage comes down by time.
Instability happens most of the time when we have a third party for our project.	We are forced to deal with instability in the project performance and we don't have the choice to accept it or reject it. All what I do as a project manager is to plan to avoid it, but it happens though.
	We may face instability in the quality of performance within the planned time and budget. The accepted instability will not exceed 5%.
	We face the highest percentage of instability in the project performance during the initiation phase and it does not exceed 10% of the planned performance.
	Instability happens because we always need to measure and inspect, and this takes more time and may cause delays. We try to balance between the time duration and inspection processes.
	Instability can occur during planning or implementation phases by 10% deviation.
	If the changes percentage exceeds 20 to 30% it would be worthy to revisit the business objectives and the scope of the entire project.
	Instability happens most of the time when we have a third party for our project.

Table 3. External and internal reasons behind acceptance of instability in the project performance

The number of reasons behind the instability that comes from the internal environment is higher than the number of reasons of instability that comes from external environment. The external reasons may have higher effects on increasing the instability of the project performance especially when talking about resources and customers as shown in the table above. The project managers believe that it is natural to experience changes in the price of the main resources of the project and that this kind of change is moving in the direction of increasing prices not decreasing on the long run. In the case of experiencing the changes in the prices of the main resources of the project and especially if there are not substitute cheaper resources then the project manager is forced to accept the.

There are individual differences among project managers in the level of acceptance of this change in the prices. We mentioned that some of them have a list of other suppliers as a precaution, other have a financial preservative as a precaution, few have scientific references and brainstorming sessions to innovate or find better solutions for keeping the quality and overcoming the increase in the price. This again depends on the style of knowledge creation they use. We still have a number of project managers who accept the change in the prices of main resources and work with this increase even if this means higher costs and less profits as long as the project is still able to cover its total costs. Another reason that the project manager accepts the instability in the project performance is when the project manager works with less experienced employees. In this case the project manager is coaching these employees and they are still in the learning stage. Sometimes the less experienced employees are experienced and specialized work wise, but they are less experienced regarding the cultural aspects of the project or organizational environment, so they take some time to learn about the culture and cope with it. In this case the project manager expects and accepts the instability of the project performance for in the short run and temporarily until the less experienced employees take enough time to learn. One of the instability reasons in the project performance happens in the last stage of the project. It is during the delivery stage when the project is delivered to the customer. During this stage conflicts may arise with the customers about the finishing touch of the project. In this stage the project manager may add extra tasks to the plan to respond to the customer needs and this causes acceptable instability in the project performance.

One of these external factors is the delay in the needed financial resources. This delay is one of the reasons of instability, but the project manager is forced to cope with it. There is no chance to find extra money from other sources outside the organization for which the project belongs. In small or new projects where budgets are still small this problem is more probable to exist. In large projects the number of workers is relatively big number which means that the span of control of the project manager is bigger and this may lead to instability especially if the project needs designing skills. If the project manager is required to provide tailored product to the customer the supervision becomes more difficult especially in large projects. In this case the project manager expects that and gives more time for designers and more space for supervision tasks and accepts the instability in performance that is caused by this reason as long as it leads to better quality of the final product. The larger the span of control the project manager has, the more instability in the performance due to human resources management problems. Dealing with suppliers becomes more difficult if the main resources are scarce ones. If the number of suppliers is small or if there is sole supplier for certain items, the dealing with suppliers becomes more sensitive to change. The project manager needs to work with suppliers who deliver the needed quantities of the raw materials on time and conforming to the required specifications to assure the quality of production. This commitment of the supplier facilitates the inspection processes and saves time for the project manager and hence affects the performance stability in a positive way. The project manager keeps insurance and strict conditions clear in the contract with suppliers to control the risk of lack of commitment from the supplier's side, however; the project managers said that the delays that are caused by suppliers are expected and that this is related to the market conditions and ratios of demand on certain resources. The implementation processes may become slower than the planned ones. The rationalization behind this is that the actual wasted time is higher than the planned downtime of the implementation and production processes. The skills of workers play a great role in speeding up the implementation process. If the project performance is stable, then the implementation goes smoothly and quickly towards the completion of the project. If the performance is instable then the implementation gets slower. On the other hand. If the implementation is conforming to the plan this leads to the stability of the project performance and vice versa. Delays in the project implementation may also exist because of lack of knowledge. Sometimes the problem is the plan itself and that the plan is not realistic, so the implementation is affected by that and includes problems. Delay of delivering the project to the customer is an indicator on the instability of performance in the last stage of the project performance even if this happened because of delays in earlier stages of the project life cycle. This means that the project manager until the last stage of the project life cycle was not able to manage the delay that happened in the implementation in earlier stages of the project life cycle. Some of the project managers reported that they repeatedly face the problem of the escape of team members during the implementation process. It was found that the project managers prepare precautions for this escape and that they can afford the escape to a maximum of 30% of the team members and are able to manage it, however; they still perceive the escape of team members as a main source of instability in the project performance. In general, the project manager accepts the instability that occurs at the beginning of the project during the initiation process. Project managers said that at this stage they accept up to 20% of instability in the performance indicators and this percentage comes down by time. This is due to the combination of new components coming together at the beginning of the project and the need for some time to understand the system of the work

and do it routinely, then the rest of the stages become more stable and the project manager considers the instability at the beginning of the project as a temporarily accepted instability. The project managers in general believe that the instability in the project performance is a must and that they experience the instability in the project performance in each and every project and by different percentages. They admit that it is impossible to achieve the plan by 100% accuracy. The optimistic project manager in the sample did not exceed the 90% accuracy. One of the project manager said that I am forced to deal with instability in the project performance and I don't have the choice to accept it or rejects it. All what I do as a project manager is to plan to avoid it, but it happens though. Some managers never accept more than 5% instability in the project performance and other project managers accept up to 20% of performance instability in certain aspects like the quality of performance and in certain stages like the initiation stage. Some project managers assure that the highest percentage of the performance instability happens at the initiation stage and it doesn't exceed the 10%. From the responses we got from the project managers we can think of a lower limit of instability which is 5% and an upper limit which is 20% and that the rest of the project lie in between these two limits. 10% instability in the project performance for example represents a normal and within the range percentage in this sample. The definition of instability is not the same for the project managers. We found that some project managers refer to the quality of performance to reflect the stability of the performance. Other project managers refer to the time delays as a sign of the instability of the project performance. There is a dilemma that causes instability for the project manager. It is about choosing to proceed on in the implementation process or to stop for inspection. The inspection process takes time to measure and report the deviation and to work on it and the accuracy of the inspection is positively related to the costs of the project. If the project manager needs to have higher level of accuracy in the inspection process, then the cost of this inspection becomes higher and the inspection will take more time. They are trying to balance between the time needed for implementation and the time needed for inspection. They are also trying to balance between the cost needed for implementation and the cost needed for inspection. This balance determines the level of stability of the project performance and it is not an easy task to find the balance that achieves the optimum stability in the project performance. Another very important reason for instability is when the project manager or his or her organization lack of clients in the market who are the end users of the project. When we interviewed IT companies who build online and mobile smart customer service system for banks. They have their offers and they do not start implementation unless they have a deal and a contract with the customer.

Another aspect of instability is the instability of the availability of resources. The project manager needs to choose between safety of availing resources at any time during the implementation of the project which enhances the stability of the performance, and the cost of storing. Sometimes it is not possible to store the resource simply because it is used by more than one project like some equipment. Other than that, there is the scarcity of resources and the market problems like changes in the prices of resources and lack of commitment from the suppliers' side. All these factors make the unavailability of the needed resources at any time of the project life cycle expected and may be accepted to a certain extent. One of the interviewed project managers said that there is a group of project managers working on different projects in his organization. All of them have instability ratio of about 5% in the availability of resources. In general, we can say that the instability can occur during the planning phase and also during the implementation phase or maybe even after that. It is found that there is no project manager believes that the instability ratio of the project is possible to equal to zero%. It is also obvious that if the instability exceeds the upper limit which is 20% the project manager translates this as a drawback or a weakness in his or her management. Accordingly, minimization of the performance instability is a target for the different styles of project managers. Even the innovative project manager knows and accepts a certain amount of instability in the project performance for the purpose of achieving better stability in the future. One of the highest areas in performance instability in this sample is the area of availability of resources and it was found that this is the only area where the project managers reported that the instability may exceed the upper limit which is the 20% deviation in the plan. The undependability on other parties is a reason for decreasing the instability in the project performance. If the instability ratios exceed the 20% and is between the 20% and the 30% project managers would find it worthy to revisit the business objectives and the scope of the entire project and change it. One of the indicators that assure that the dependability increases the instability in the project performance is that we found that the project managers believe that the instability happens most of the time when they have a third party for their projects. The interference of a third party like a consultant for example will increase the dependability of the inputs of this third party and will cause some conflicts and this will slow down the completion of the project. One of the things that were found is that there are few project managers who refuse to accept any kind of instability, however; it happens. They work hard on the 100% conformance between the plan and

the actual implementation and this is their main concern, so they refuse the idea of accepting instability even due to uncontrollable reasons.

What is the level of complexity in the IT project? How does it affect performance stability? And how to avoid that effect?

Complexity is related to the number of components of the system in which the project manager is functioning. It also refers to the level of dependency and interrelationships in the organization. It also refers to the environmental and the contextual complexity as well as the size of the project itself. In the following table the researchers are classifying the effect of complexity on instability based on the dimensions of complexity that are mentioned in the study.

Effect of complexity due to project system size on instability	Effect of complexity due to project system variety on instability	Effect of complexity due to project system interdependencies on instability	Effect of complexity due to project system context on instability
Planning for large sized projects.	The plan becomes complex if it includes dealing with many stakeholders.	Interdependency of the plan on the plans of other projects in the organization and on the overall plan of the organization.	Cultural aspects of the plan.
Customer needs may require increasing the size of the project.	Customer needs may require dealing with many suppliers and/or investors.	More than one project are implemented at the same time to fulfill the customer needs leads to higher interdependency among projects.	Customer needs are components of the project environment which may change it rapidly.
More complexity is a motive to increase the principles and the relationships that leads to the successful implementation of the project even if this increases the size of the project system.	More complexity is a motive to increase the principles and the relationships that leads to the successful implementation of the project even if this increases the variety of the project system.	More complexity is a motive to increase the principles and the relationships that leads to the successful implementation of the project even if this increases the interdependency of the project system.	More complexity is a motive to increase the principles and the relationships that leads to the successful implementation of the project even if this increases the complexity of the context of the project system.
	It is more difficult to find workers to implement certain specialized tasks in complex projects.		Arab countries have its own mechanisms of implementation and certain policies and legislations to make decisions about the projects.
Over planning and over structuring causes radical changes in time schedules and costs when there is a need to change the plan.	Over planning and over structuring causes radical changes in time schedules and costs when there is a need to change the plan.	Over planning and over structuring causes radical changes in time schedules and costs when there is a need to change the plan.	Different culture background people might have would complicate communication and delay project progress.
	Delay in receiving the resources needed for implementing the project.	Delay in receiving the resources needed for implementing the project.	

Table 4. Reasons and effects of complexity of project performance

Project manager’s job to achieve the stability of the project performance becomes more difficult when there is high level of complexity. In the planning stage the complexity increases when the plan is prepared for a big sized project. It also increases if the plan is highly depending and interrelated with the plans of other projects that will be implemented in the same time or will overlap with the current project in parts of it. Also, if the plan is depending on the overall plan of the whole organization this means that the plan is relatively more complex, and this is normally what happens because we can rarely find that the project manager is independently working without synchronization with the overall plan of the whole

organization to achieve the strategic goals of the organization. The plan becomes more complex in case the project manager is forced to deal with a large number of stakeholders. If the size of the project is large, then this means that the project manager is dealing with large number of workers and this means wider span of control and more responsibility. This also means larger number of equipment, resources, suppliers, and tools. Higher number of reports and inspection processes and maybe dealing with higher number of investors. This increases the complexity of the planning process for the project manager and this means that the planning stage in a complex environment is relatively more difficult than the planning process in less complex environment. In some organizations the culture is supportive in a way that enables the project manager to consider some components of the plan as naturally understood and no need to include its details. In other organizations the culture is hindering the smooth implementation of the project and therefore the project manager is forced to explain each and every detail in the plan to avoid any cultural conflicts and this may increase the complexity of the project plan. If the customer needs are rapidly changing because of competition this means that the environment in which the project is functioning is rapidly changing, simply because the customer is one of the components of this environment. Sometimes the customer is a huge organization and the project is divided into number of sub projects and therefore the dependability among those projects increases and this increases the complexity. Some of the project managers considered that the complexity is a motive to increase the relationships and the principles that assure the successful implementation of the project. In this case the project manager accepts the increase in the size, the dependency, the variety and the complexity of the project system and they think that this leads to better performance and more successful one. Complexity leads to consideration of higher number of variables and hence this leads to better control and thus the level of performance stability increases. This is an opposing point of view. Some of the project managers refer to the policies and legislations of the Arab countries as part of the environmental complexity that they have to deal with to manage their projects. If the legislations are experienced before then the instability that is caused by this legislation becomes less due to experience on how to deal with it. Project manager believe that it is more difficult to find workers to implement certain specialized tasks in complex projects. The routine work is much easier to be implemented than the tailored one. The complexity of the project increases when there is need to designing tasks more than routine tasks. Different cultural backgrounds people might have would complicate communication and delay project progress and this is related to the context and the cultural environment of the project. The culture as we explained is found to be a facilitator for performance stability only if it reinforces it. It can hinder the performance stability if it doesn't include the needed values for better functioning or if it includes diversified subcultures. We observed that the cultural diversity is higher in the gulf area projects and it is less in Egypt, and Palestine for example. One of the opinions about complexity explains how the over planning and over structuring leads to higher levels of complexity and that this is one of the reasons of having less stability in the project performance and the project environment as well. Over planning and over structuring is related to the relationship with stakeholders, the determination of the scope and the time schedule of the project implementation, the variety of the system components, the number and procedures of inspection processes, and so on. High levels of inspection, centralization, conformance to the plan, formality, standardization will lessen down the level of stability by affecting the morale of workers and increasing stress at work. Moreover, that the project managers explained how the over planning and over structuring cause problem when they need to change. One more factor that is considered a reason for more complexity is the delay in receiving the resources for implementing the project and this may happen because the project needs a variety of resources and this means that the project manager deals with larger number of suppliers and this increases the complexity of the work. This is more probable to happen in the big sized project more than the small ones. Also, the dependability on other stakeholders increases when the number of needed resources increases.

The following table shows the different and main effects that were found on the stability of the project performance because of complexity and the possible ways to avoid these negative effects from the project managers' perspectives.

Effects of complexity on instability of project performance	How to avoid the effect of complexity on instability of project performance
Complexity leads to delays of submission.	This needs more coordination among projects to avoid loses.
In case the project manager faces any unexpected problems in the project this will affect the stability of its performance.	Higher level of complexity is related to the need for more experienced project manager.
Complexity greatly affects the success or the failure of the project.	Based on the functional needs, sometimes we need to change the plan or the style of project management.
Yes, because it greatly affects the delay in implementation.	There has to be one clear vision without complexity.
It will cause the lack of ability to recognize the risks related to the project.	We must take into account both flexibility and possibility to introduce changes in the plan.
Complexity leads to increase in time needed for implementing the project, and consequently leads to decrease in profits.	Project environment must comfort the workers in the project and also it is better if they have common culture.
If there are cultural problems this will highly affect the success of the project. Different culture background people might have would complicate communication and delay project progress	More complexity needs more planning.
The outdoor climate for example is one of the factors that may affect the project stability.	More complexity needs more time.
	Before looking to complexity, we must look to the project environment.
	The degree of project attraction is more important.
	Easiness of communication, common aspects, and using the right language.
	If there is high level of awareness about the project dimensions and its importance.
	If the goals and number of activities needed are clearly determined complexity will not affect project stability.

Table 5. How to avoid each effect of complexity on project performance's instability

In general, the effects of complexity on the project performance are including facing unexpected problems, delays, percentages of success or failure of the project, level of project risks, costs and profits of the project, and complication of communication.

In this part we analyze the opinion of the project managers who think that the project complexity does not affect the stability of its performance.

One of the points of view discussed the importance of the project environment as a controller of the project complexity. As long as we can deal with the environment of the project positively and successfully there is no effect of the complexity on the performance of the project according to this point of view. Another point of view is giving higher importance to the level of project attraction. This group of project managers said that it is more important for us to measure the project attraction to the customer and this enables us to work positively with the complexity and bring on the performance stability because the return on investment in this case will be high. Less effort is exerted with less attractive projects.

Other reasons behind the ability to minimize the effect of complexity on performance stability is the easiness of communication among team members and with external stakeholders, common aspects between the project manager and top management, the project manager and the workers, the project manager and the suppliers, the project manager and the customer, and the project manager and the investor especially when working with diversified cultures. Another point of view explains the importance of having high level of awareness among workers about the project dimensions and its importance. If workers are aware about the project importance and its contribution to their personal success, they will be motivated to make it happen successfully and to deal with larger number of variables and demands to succeed especially if the goals and number of activities needed to be implemented are clearly determined.

5. Conclusion

This research is an attempt to analyze the effect of the knowledge creation in general and innovation specifically on the performance of the IT project. It was found that the different dimensions of the project performance like quality, time, cost, and productivity are affected by innovation of the project manager. This effect depends on certain factors like the acceptability of the instability of the project performance. In certain cases, it is possible to accept the instability of the project performance especially if it is related to uncontrollable factors, however; there is a consensus among project managers that acceptability of the instability is temporarily approved and is most of the time avoided by project managers. The complexity plays a great role in affecting the project performance and it has two sources, internal and external ones. The research came up with different solutions to minimize the effect of complexity of IT projects on the stability of its performance. For further research it is recommended that the conceptual model of this research is followed by quantitative analysis for the relationship between the innovative project manager and the performance of the IT project in the market.

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