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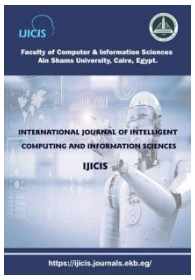

AGILE SOFTWARE DEVELOPMENT PROCESS ORIENTATION FOR ELIMINATING ERRORS AS NON-VALUE-ADDED ACTIVITIES IN FOOD AND NUTRITION INDUSTRIES

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Abstract

The Agile development process in software provided many opportunities for development to meet customer expectations and continuous technological changes. Through this research, it was possible to analyze the visions of software users used in production operations in food factories to identify quality specifications for programs and errors as non-value added activities such as errors and time wasters. And iterations in order to study how to reduce it. Data were collected for the research through personal interviews with leaders, officials, software programmers, and distributing 400 survey questionnaire forms to employees. One incomplete survey was excluded to become 399 forms for users of this software in factories. The participants in the research were selected from software users in the factories under study from a random group of workers in food factories in the sample under study, and the rest of the data were also collected through personal interviews with software programmers who develop software for factories The results of the field study, which took place during the food factories in the sample under study, showed that the development of software used in the operation of production in food factories using the Agile development method, ensured the modification of software functions to ensure the prevention or at least the reduction of non-value-added activities. The sample were divided according to the classifications of the food industry and it was found that the increased added value as well as reducing the risks resulting from the use of such software in the operations of production in those factories were established.

Keywords: *Agile software development, Value added, Business Process Orientation, errors, non-value-added activities*

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1. Introduction

The software used in manufacturing to follow-up the production processes in food factories is one of the basic components of production elements. It may contain many non-value-added activities such as errors, failures, and faults. There is a need to control them because it can lead to high rates of sequences resulting from these time-wasting activities, as well as increasing the chances of exposure to risks during manufacturing processes based on this software. Software error rates are defined by:

"Main risk resulted from errors in software design"

In order to control these errors as non-value-added activities, there must be continuous follow-up to the application of this software and maintaining of the possibility of their occurrence during operation.
These errors can be attributed to the following:

a. Lack of experience and knowledge of workers in how to use such software.
b. The difficulty of self-reliance of employees when they use this software without referring to software experts.
c. The need to support communication with each other and users to provide advice on how to use software.

1.1 Challenges Faced by Software Development Using Traditional Methods

Among the challenges faced in arriving at a design that meets the needs of factory workers and users of such software are the following:

1. There is no clear information for software developers about modification suggestions in those programs.
2. The productive system needs to develop programs to ensure the reduction of errors.
3. The emergence of risks resulting from these errors as non-value-added activities.
4. The need to emphasize training on the correct use of such software to ensure that errors as non-value-added activities do not occur.
5. Learn the programmers' directives to reduce the occurrence of these errors as non-value-added activities
6. Attempting to add improvements to the software to ensure an increase in returns as a result of using this software.

2. A Brief Overview of Literature

2.1 The Agility Meaning?

Agility is the ability to create and respond to change to generate profits in a stormy business environment.

2.2 Agile Software Development Definition

Agile software development [1] means providing the appropriate environment for integrating the viewpoints of software dealers, the values of cooperation and the principles of development in a methodology that meets the requirements of development.

2.3 Agile Software Development Concept

Agile Software Development follows the concepts of software quality management .The meaning of agile development methodology [2] is the development of applications to be versatile, and the agile development model is due to a method of software development based on iterative development, as agile development methods divide the tasks in a software development project. The tasks are divided into small iterations or parts that do not need long-term planning, and the scope or requirements of the project are determined into Functional and non-functional at the beginning of the software development project, as well as plans for iterations, and the scope and duration of each iteration must be predetermined before the start of the project.

Each iteration is not considered a short-term part of the development process according to the agile model and dividing the project into small tasks helps reduce the risks associated with the project as well as reduce errors as non-value-added activities as well as reduce the time required to achieve functional and non-functional requirements. In the software development life cycle, which includes the following steps:

2.4 Phases of Agile Model:

Following are the phases in the agile model [3] are as follows:

1. Requirements meeting
2. Design the requirements
3. Construction/ iteration
4. Testing/ Quality Assurance
5. Deployment
6. Feedback

3. Continuous Agile Chartering.

Planning for continuous flexible development practices is done through the following [4] daily practices:

1. Determining the types of meetings: the daily coordination meetings and weekly meetings are determined to follow up on what is happening daily
2. Planning for future meetings: planning to review what has been implemented in previous meetings, planning the implementation of the program, and investigating the required modifications in quick meetings.
3. Preparing for the backlog: preparing the work team for the backlog, studying the group of components of the program, prioritizing the implementation of the backlog and examining the product.
4. Repetitive procedures: studying the application and simultaneous applications with it, and repetition in applications.
5. Lessons learned: Determining the retroactive application and identifying the work team to determine the retroactive impact of the application.
6. Review and sample presentation: review the application, record the application review, review the repetition in the application, review the decisions implemented in quick meetings, and review the implemented program development project.
7. Progress activities: investigate what has been done through the development of the program

Agile Testing Methods [5] :

1. Scrum
2. Crystal
3. Dynamic Software Development Method (DSDM)
4. Feature Driven Development (FDD)
5. Lean Software Development
6. Extreme Programming (XP)

4. Agile Software Development

To define this method in software development, we find that it led to a reduction in errors as non-value-added activities and to achieve more flexible production and a higher ability to make modifications or additions to software. It also provided the opportunity to obtain more accurate results, as well as reducing manufacturing errors and encouraging reducing the resulting risks from the use of such software in the processing of products.

For this reason, the need to add modifications in the design of the program according to the preferences of the users has become necessary and results in the reduction or limitation of errors as non-value-added activities resulting from the use of these programs.

Agile Software Development ensures redesigning software According to the growing preferences towards developing the method of software design in a way that ensures continuous evaluation of the software. To identify errors in the design of that software with the aim of modifying it in future versions, as well as determining the extent to which users accept that software and its effectiveness towards the purposes for which that software is used Agile Software Development methodology is effective.

Although there is a prior evaluation of this software before starting its application and during the distribution of the initial trial versions to a sample of users, the following issues is noted:

1. The software has not been fully evaluated due to the preoccupation of factory workers and users of those software with the tasks of operating factories and their lack of time.
2. The evaluation that occurs if it occurs is a theoretical evaluation from the programmer’s point of view and does not include modification suggestions
3. Instructions for programmers and programming experts include a description of how to use the software.
4. Initial tests do not include the usability of the software.

Accordingly, several personal interviews were held with the officials in the factories. Through this research, the agile software development method was evaluated to ensure the reduction of errors as non-value-added activities and to identify the experiences and satisfaction of the users of this software in the factories.

5. The Use of Agile Software Development for Building Products That Deliver Continuous Value To Customers.

Success in building products that people want creates customer loyalty to the product [6], rapid development and global competitiveness drive producers to build sustainable products and the concept of no fixed project is the way for operating companies.

Agile software development is an initial reaction to failure to meet the requirements predicted by software engineering, it takes the concept of feedback and experience to build software.

6. Challenges to Building Products that Provide Continuous Value to Users

In order to build products that can provide continuous value to users using the concept of agile software development, the following challenges must be overcome:

1. The difficulty of accessing the required challenges, methods of data collection, and the need for the system to have the ability to measure the orientation of the specific activities that are required to be investigated to be updated in the new system.
2. The need for updates according to the initial data collected to be part of the functional requirements of the system when designing the used hardware devices.
3. Users have poor experience with the available tools that can integrate with their existing tools. There are many programs and tools that can be searched on the Internet and many of them may be free because it is open source. These tools can be employed and modified to support work problems in the factory.
4. The high cost of testing environments for the software to be developed. That includes the real experience in the test environment, which is very expensive, and many tests may need physical test environments that may cost the factory many resources, so the testing phase needs to add additional steps before doing it to ensure the need for testing the hypothesis before providing the necessary test environment for it.
5. Work restrictions on the experimental level may hinder the realistic study of software and access to a safe system free of errors as non-value-adding activities, and these systems consist of other sub-systems governed by many restrictions and experiment for these systems must be according to the permissible limits and in accordance with the regulations and laws.

7. Foundations of Agile and Agile Frameworks

For Meeting the customers' desires, Lots of possibilities for up-to-date customer observables and easier ways [7] to gather consumer insight into a product which is software allowing software developers to switch learning cycles and improve their understanding of consumer value.

The concept of building software in agile development method and accompanying services is based on constantly employing new versions for the consumer [8].

Instead of going back to and redefining previous requirements or assumptions based on users' opinions, the consumer value of products and their functions or features can be studied by conducting several experiments to ensure their suitability to the actual needs of the market.

7.1 Flexibility in Software Design

Flexible applications change the way business is done in organizations and respond to changes in the external environment [9], but to reach success. All employees who use this software must adopt these applications in the organization, not the IT team, including the software development team. In order to achieve flexibility in software design, which included diversity in meeting requirements, the following must be adhered to:

1. How to attract users to work through these applications?
2. The ability to access applications through cloud computing from anywhere other than the work periods.
3. Ease of working with applications via the web on laptops, smart phone or tablets.

7.2 Relationship of Software Development to User Requirements

1. The tests that are carried out periodically on the programs and applications correspond to the needs and requirements of the user.
2. It is possible to change the way the program is used to ensure that it is easy to work on without the need for additional training.
3. The activities carried out through the program are appropriate to the needs of the business as a whole.

8. Teamwork Management

How can the work team work together to reach high-quality applications? So that a work team can be built in order to build software applications and lead them in a realistic and sustainable way to solve the problems facing work teams in developing generations of software applications [10]. where the work teams use simple and specific applications whose effectiveness has been proven In working on directed projects [11], but the application that may be suitable for a work team may not be suitable for other teams, and therefore the problems associated with different ways of thinking of individuals in the same work team must be overcome.

9. Managing Iteration Planning Using Agile Techniques

Software development efforts need to change according to changes that occur in the external environment [12], such as the emergence of new technologies, the emergence of competitors, or economic shifts.

Sometimes the programmer needs to innovate as a result of external forces [13]. If building the program based on a set of initial requirements, the program will fail in the market, but at least it will fail to reach full implementation.

Change can be expressed in the form of requirements [14], and it can be said that the basic principle facing the development of any software is the ability to deal with those requirements.

The programmer can still be in the program development life cycle, and new requirements appear that cannot be controlled [15]. As long as the requirements have changed, the amendment must be made according to them. This is what iterative development means. It means that software responds to development according to a business problem and arrives at a system that provides added value.

Detailed and comprehensive building planning, scheduling and project control needs [16]to clarify the practices required to control the modifications necessary to complete the development process for software in the event of errors, failures or malfunctions. According to the project's instructions, a document is created that contains quick and organized information that is easy to refer to in the event of any emergency malfunction.

Iterative programming processes help software developers reduce risk and cost, manage change, improve productivity, and provide timely and effective solutions. Rapid software development life cycles configured

From short-term iterations with working on the software that was launched at the end of each iteration, and there are several aspects that control software testing in the agile environment, which require the availability of skills for the tested programmer.

10. Software Errors

Error is the difference between the calculated value, the observed value, or the measured value [17]. In addition, what is between the specified true value or correcting the value or circumstance, or in other words, is a step, process, or definition of improper data. Or it is an incorrect result / or is a human reaction that results in an incorrect result

Error analysis is the use of techniques to identify errors [18], to estimate or predict a number of errors, and to analyze error data correctly

Errors occur as a result of errors in programming and coding the program [19], or as a result of the programmer being unable to run or interpret the program

11. Basic Agile principles

The Twelve Principles of the Agile Manifesto

There are twelve principles underlie the Agile Manifesto [20], those principles embody the values and provide more concrete examples of what Agile means at a lower level.

How to deliver on time, every time.

How to Increase transparency while decreasing risks?

11.1 Process Failures Within the Process Resulted From Errors As Non-Value Added Activities

Emphasizing that software development processes are free of malfunctions [21]. You need to follow up on reactions to errors that will increase non-value-added activities and thus increase the cost of the software development project.

Project control programs rely on preventing errors [22] after they are discovered during the actual use of the program in order to monitor the process of occurrence of errors, the following must be done:

Table 1 illustrates the application of each principle according to the field study for each principle of The Twelve Agile Manifesto Principles

Table1: The application of each principle in the factories under study and the percentage of application of each principle according to the field study

Serial	Principle	Application of the principle in food factories	%Application
1	Our highest priority is to satisfy the customer through early and continuous delivery of valuable software.	The preference is consumer satisfaction for early and continuous provision of valuable software, and here we mean the user of software applications.	%77
2	Welcome changing requirements, even late in development. Agile processes harness change for the customer's competitive advantage.	We welcome changing demands even if they appear late in the rapid development processes to achieve a competitive advantage.	%84
3	Deliver working software frequently, from a couple of weeks to a couple of months, with a preference to the shorter timescale.	In food factories, providing fast-running programs in a short period of time	%67
4	Business people and developers must work together daily throughout the project.	In food factories, working with software users and developers together during the project	%55
5	Build projects around motivated individuals. Give them the environment and support they need, and trust them to get the job done.	Building projects around motivated individuals.	%75
6	The most efficient and effective method of conveying information to and within a development team is face-to-face conversation.	The best way to get information during the development team is to have a face-to-face conversation.	%83
7	Working software is the primary measure of progress.	The resulting programs are the primary measure of progress.	%76
8	Agile processes promote sustainable development. The sponsors, developers, and users should be able to maintain a constant pace indefinitely.	Rapid operations encourage sustainable development.	%56
9	Continuous attention to technical excellence and good design enhances agility.	Constant attention to excellence and good design to improve the speed of software development.	%81
10	Simplicity--the art of maximizing the amount of work not done--is essential.	Simplicity in completing the unprocessed work of software development.	%89
11	The best architectures, requirements, and designs emerge from self-organizing teams.	Better architecture, requirements and designs appear in self-organizing work teams.	%91
12	At regular intervals, the team reflects on how to become more effective, then tunes and adjusts its behavior accordingly.	The team reflects how it is becoming more effective and adjusts its behavior accordingly	%80

1. Focusing on the development process and determining all the outputs of this process and the results that appear in performance during use and the extent of the impact of each function of the program on work performance

2. Emphasis on tracing the source of the error. Good follow-up to the development process is achieved by tracing each element of the work and making sure that it is completed in a flawless manner. It is necessary to correct the error as soon as possible.
3. Follow-up to the extent to which value is achieved for the user. The value for the user increases if the program is designed to achieve response to the user's realistic requirements and continuous follow-up to the possibility of achieving them.
4. Follow up on the use of tools and methods that support continuous improvement by overcoming and correcting errors.

12. Research Objectives

1. Demonstrate the ability to participate effectively in agile development practices for software development.
2. Understand the purpose of using agile software development practices to limit or reduce errors as non-value-added activities.
3. Studying the possibility of applying the principles of agile development in the applications of food factories.
4. Determining the general problems resulting from errors as non-value-added activities, and how to overcome them through agile development.
5. Understand errors as non-value-added activities and identify the most important contents necessary to overcome them.

13. Research Problem

Competition and changing markets make it imperative for organizations to reach dynamic adjustments in production to obtain new opportunities and competitive advantages quickly and in line with business needs

Through the exploratory study and through holding several personal interviews with the officials in the factories, it was possible to identify the manifestations of the research problem as follows:

1. There is a need for modification in the design of the software used in operation to ensure the limitation or at least the reduction of errors as non-value-added activities such as errors, repetitions and defective appearance, as well as reducing the risks resulting from the use of such software in the operations of production in those factories.
2. Achieving user satisfaction when using this software so that the way to use the software is easy, clear, useful and compatible with business needs, and the need for training in its use does not take long time.
3. Software users need to fulfill the functional and non-functional requirements of the developed software.
4. Achieving the quality of the resulting information. When extracting the information resulting from processing the data used in making or making decisions, which appears in the form of queries or reports, it must be subject to information quality standards to be complete, timely and closely related to business needs. That adds improvements in decision-making skills based on The information extracted from those applications as well as its support by means of communications.

5. The need to increase the benefits achieved from the use of applications, as there is a desire by many users of software to add new activities to the programs when they are re-designed to achieve an increase in the added value of the product.
6. The need to reduce work restrictions using software and facilitate the way to use it by supporting applications with means of communications.
7. Knowing how to deal with production risks if they occur, as well as increasing the download speed of such software when starting production and linking it to web applications and enabling the use of cloud computing for the possibility of officials following up on production in any time remotely.

14. Research Methodology

Through personal interviews with officials in food factories, as well as software developers, and distributing a 399 questionnaire form to employees who use software. it was possible to assess the perception of software users towards software development and the agile method used in that, and to arrive at a method through which the non-value-added activities associated with the use of these applications could be evaluated and an attempt to prevent them Or at least limit it. This included training employees on the skills of dealing with this software in a correct manner, analyzing the components of this software, and studying interaction with the user and the various activities in which this software are used.

14.1 Data and Empirical Model

This study investigates how to direct information technology resources by the use of the agile development in light of the changing and dynamic environment and take advantage of the available resources in technological tools and their relationship to directing business towards success and leadership in organizational performance by excluding errors as non-value-added activities. Internal and external information and social media as basic variables of information technology resources.

14.2 Research Population

The Research population includes a group of industrial establishments in the field of food industries.

14.3 The Research Sample

Due to the difficulty of obtaining data from all industrial establishments in the field of food industries, a stratified sample was used for the sectors sampling frame to obtain a representative sample of the population under study. The research sample included the following sectors:

Table 1 shows the percentages of distribution of the research sample to industrial establishments in the field of food industries according to the activity. Table 2 shows the percentages of distribution of the research sample according to food industry sectors:

Table 2: The percentages of distribution of the research sample according to food industry sectors

serial	food industry sector	percentage
1	sugar industry	%10
2	Manufacturing of vegetable oils and animal fats	%10
3	Dairy industry and its various products	%15
4	Fruits, vegetables and legumes canning industry	%15
5	Beverage, juice and mineral water industry	%15
6	Manufacturing of chocolate and sugary sweets	%15
7	Sweets and biscuits industry	%10
8	Other	%10
	Total	%100

14.4 The Research Application

It was possible to reach many facts through personal interviews, and the participants in the research study were randomly selected, and all personal interviews were conducted in personally.

The research was applied taking into account the following:

1. Similar characteristics and functions that are done through software used in factories.
2. Determining the software development methodologies used and categorizing them into agile and another.
3. Identification of negative and unknown cases of software use outcomes.
4. Setting unified criteria for evaluating the software development method in all the factories under study.
5. Restricting personal interviews in the pilot stages of programs to factories that have completed all stages of software development and modifying the activities that are carried out through them.
6. Emphasis on diversity in the research sample so that it includes a wide range of functions that are carried out through the software used in the sample under study.

14.5 Data Collection

The basis of the study was to investigate information from users of programs and applications in factories, who had previously been well trained on how to use programs and applications in food factories, and their observations were recorded according to the personal interview. Software users were divided according to Table 3 which shows the percentages of distribution of the research sample according to user's categories.

Table 3: The percentages of distribution of the research sample according to user's categories

serial	Categories	Category	percentage	Category	percentage
1	**General experience of using software**	From three to five years	%58	From six years and over	%42
2	**Powers of access to data through the information system**	Full access to information	%19	Partial powers of access to information	%79
3	**The relationship of the applications used to the production run**	direct basic relationship	%67	indirect relationship	%33

14.6 The Research Limitations

The limitations of the research were represented in the food and nutrition factories in Egypt to collect data about them, because the food industry is one of the necessary industries for the Egyptian economy.

14.7 Research Variables

The following diagram shows the Research variables

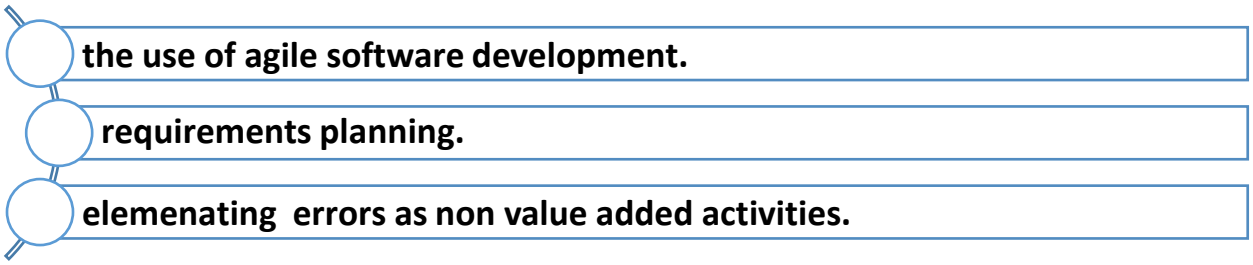

Figure.1: The Research variables

14.8 Hypotheses Design

14.8.1The Design of The First Hypothesis

The relationship between directing electronic business towards focusing on value-added activities plays a key role in the relative improvement in the value of the organization as a whole. as it must be within the context of business operations, as well as business performance data that affects the value of the organization must be Investigated and analyzed in different situations according to the variables that affect the industry. Also, the characteristics of the manufacturing environment in which work is done to classify its activities into value-added activities and errors as non-value-added activities.

The food industry has a special nature that needs to be in line with international food standards, which requires more attention on the part of those in charge of the industry. This industry also focuses on the nutritional habits of consumers, the diets they follow, and the impact of the ingredients of the food product on public health.

This hypothesis was made on the basis that the integration between the extent to which e-business is directed towards focusing on value-added activities effectively leads to a relative improvement in the value of the organization affected by many factors.

Accordingly, the first hypothesis was formulated as follows:

14.8.2 The First Hypothesis

There is a significant statistically significant relationship between the relative improvement in the specifications of programs and applications used in the factories under study using the agile software development method, and between directing electronic business towards focusing on value-added activities.

14.8.3 First Hypothesis Testing Method

14.8.4 H0 The Null Hypothesis: there is no statistically significant relationship between the relative improvement in the specifications of software and applications used in the factories under study using the agile software development method, and directing electronic business towards focusing on value-added activities.

14.8.5 H1 The Alternative Hypothesis: there is a statistically significant relationship between the relative improvement in the specifications of programs and applications used in the factories under study using the agile software development method, and between directing electronic business towards focusing on value-added activities.

The independent variable = X; represents the relative improvement in the specifications of the software and applications used in the factories under study using the agile software development method.

Dependent variable =Y; represents directing e-business towards focusing on value-added activities.

14.8.6 Statistical Analysis of The First Hypothesis

Simple linear regression analysis was used, and the results of the analysis can be shown in Table 4 to Table 8.

Table 4: Descriptive statistics

	Mean	Std. Deviation	Range	Minimum	Maximum	Variance	N
Y	37.69	4.048	10	30	40	16.384	399
X1	37.8647	3.63425	10.00	30.00	40.00	13.208	399

Table 5: Correlations

	Y		X1	
Pearson Correlation	Y		1.000	.986
	X1		.986	1.000
Sig. (1-tailed)	Y		.	.000
	X1		.000	.
N	Y		399	399
	X1		399	399

Table 6: Model summary

Model 1	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
	.986[a]	.971	.971	.685	.971	13506.499	1	397	.000	1.003

a. Predictors: (Constant), X1

b. Dependent Variable: Y

Table7: ANOVAa

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	6334.505	1	6334.505	13506.499	.000[b]
Residual	186.192	397	.469		
Total	6520.697	398			

a. Dependent Variable: Y

b. Predictors: (Constant), X1

Table8: Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations			Collinearity Statistics	
	B	Std. Error	Beta			Zero-order	Partial	Part	Tolerance	VIF
(Constant)	-3.871	.359		-10.775	.000					
X1	1.098	.009	.986	116.217	.000	.986	.986	.986	1.000	1.000

From the previous analysis, we find that the independent change explained the ratio of 98.6% of the relationship.

The value of the correlation coefficient R =.986

Correlation coefficient (r) = +0.9. Positive linear relationship.

The value of the coefficient of determination R Square (R 2)=.971

Constant= -3.871, Beta= 1.098**,** Std. Error=.359

The Regression equation is given by $\hat{y} = b\,0 + b1\,x \pm \text{errors}$ ($\hat{y} = -3.871 + 1.098x1$)

The following Figure. 1 shows two charts that show the dependent and independent variables in the first hypothesis and Figure. 2 shows the regression relationship of the first hypothesis.

14.8.7 Second Hypothesis Design

The relationship between directing e-business towards focusing on value-added activities plays a key role in compatibility with the changing dynamic external environment, the basis of which is the rapid rate of change and the need to predict those future changes and adjust the technologies used accordingly and the difference in ways of measuring consumer preferences. and external demand on the food product and the impact of the technological resources used and the available capabilities as well as their compatibility with consumer

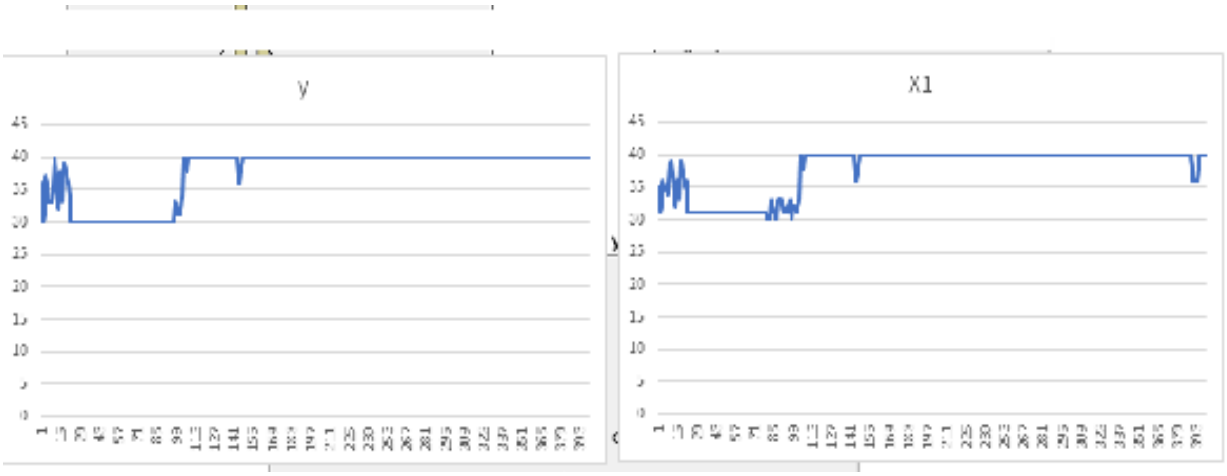

Figure. 1: Two charts that show the dependent and independent variables in the first hypothesis

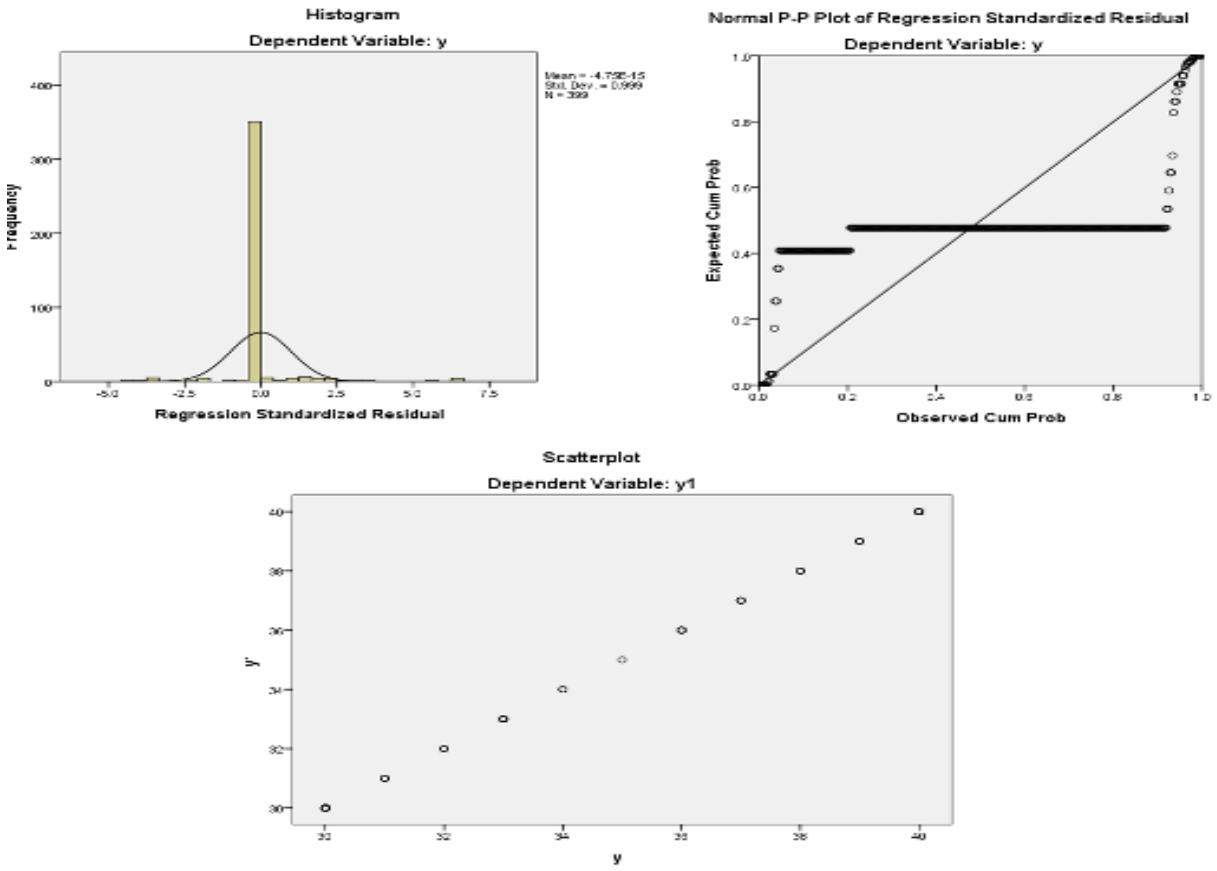

Figure. 2: The regression relationship of the first hypothesis

behavior and business processes, and to identify how to reconcile those available technological resources through the use of the agile software development method. And benefit from them in compatibility with business processes and manufacturing behavior according to the changing and dynamic environment that operates in Under the organization. Which is considered essential in determining the competitiveness of the organization. The change in food preferences of consumers requires rapid change according to changes in environmental conditions that are constantly changing. which results in the need to develop or invent a new food product, which starts from presenting it until reaching the non-production of it again.

The introduction of new food products has become necessary, as the consumer does not want repeated products and information about the food product changes rapidly. Which makes it difficult for the organization to predict environmental conditions and discover the possible effects of innovative technological changes based mainly on information technology on consumer needs and behavior and interpret this in the form of activities specific is done by directing IT resources. So it can ensure access to manufacturing operating environment compatible with the changing external environment and the dynamic and competitive product globally competitive environment is accompanied by currently weak demand for food product local (Egyptian) globally and low levels of diversity in the products offered. Which it led to increased pressure from nutrition experts in factories to devise new and innovative ways to adapt to these changes. reduce risk levels, and maximize ways to benefit from information technology resources to reach new markets. to increase the quality of the food products and passing higher levels of innovation in the produced food products through the development of existing products or the creation of new products with an emphasis on value-added activities and the exclusion of errors as non-value-added activities, which leads to compatibility with the changing dynamic external environment.

As well as employing computer networks to link individuals dealing with the organization, whether from inside or outside it, with the organization's management team or external experts and consultants. Moreover, work to make these networks a strong supporter of these relationships. Which appear in the form of interactions between these individuals, experts, external consultants and the management team in the organization. so that they all agree on unified interests in a way that ensures the success of the organization in overcoming errors as non-value-added activities as well as compatibility with the changing dynamic external environment.

This is due to the reorientation and development of visions to reach new ideas that can be developed and focus on value-added activities and reduce or exclude non-value-added activities, and the interactions between these parties through networks will lead to strengthening the organization's ability to benefit from its resources of information technology. Leading to adapt to the changing dynamic external environment

In addition, business networks can facilitate communication, participation, exchange of information and ease of dissemination, as well as providing knowledge through the organization, which results in cost savings and access to environmentally balanced and stable business processes as well as can encourage innovation in the food product. as well as it can be an essential component in directing Business towards seizing opportunities available through the external environment. In addition, it can enable the organization to create dynamic processes, emphasize the flow of information, and take advantage of the available technological capabilities to achieve competitive advantages.

This hypothesis was made on the basis that:

The integration of the extent to which electronic business is directed towards focusing on value-added activities using the method of agile software development in an effective manner that leads to compatibility with the changing dynamic external environment and the fulfillment of requirements, whether functional or non-functional

Accordingly, the second hypothesis was formulated as follows:

14.8.8 The Second Hypothesis

Using the same method in the first hypothesis.

14.8.9 Statistical Analysis of The Second Hypothesis

Simple linear regression analysis was used, and the results of the analysis can be shown in Table 9 to Table 13.

Table 9: Descriptive Statistics

	Mean	Std. Deviation	Range	Minimum	Maximum	Variance	N
Y	37.69	4.048	10	30	40	16.384	399
X2	32.9774	3.47959	10.00	25.00	35.00	12.108	399

Table 10: Correlations

	y	X2	
Pearson Correlation	y	1.000	.983
	X2	.983	1.000
Sig. (1-tailed)	Y	.	.000
	X2	.000	.
N	Y	399	399
	X2	399	399

Table 11: Model Summary

Model 1	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
	.983[a]	.967	.967	.736	.967	11632.011	1	397	.000	.977

a. Predictors: (Constant), X2

b. Dependent Variable: Y

Table 12: ANOVAa

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	6305.491	1	6305.491	11632.011	.000[b]
Residual	215.206	397	.542		
Total	6520.697	398			

a. Dependent Variable: Y

b. Predictors: (Constant), X2

From the previous analysis, we find that the independent change explained the ratio of 98.3% of the relationship.

Table13: Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations			Collinearity Statistics	
	B	Std. Error	Beta			Zero-order	Partial	Part	Tolerance	VIF
1 **(Constant)**	-.029	.352		-.082	.935					
X2	1.144	.011	.983	107.852	.000	.983	.983	.983	1.000	1.000

a. Dependent Variable: Y

The value of the correlation coefficient R =.983

Correlation coefficient (r) = +0.9. Positive linear relationship.

The value of the coefficient of determination R Square (R 2)=.967

Constant= -.029, Beta= 1.144, Std. Error =.352

The Regression equation is given by $\hat{y} = b\,0 + b1\,x \pm \text{errors}$ ($\hat{y} = -.029 + 1.144x2$)

The following Figure. 3 shows two charts that show the dependent and independent variables in the first hypothesis, Figure 4 shows the regression relationship of the first hypothesis.

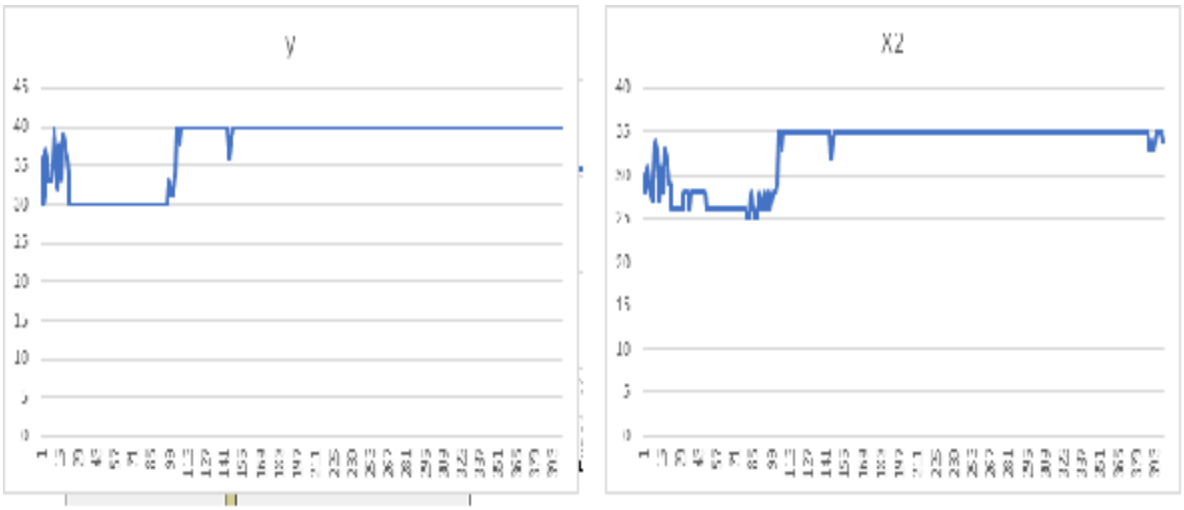

Figure 3.: Two charts that show the dependent and independent variables in the second hypothesis

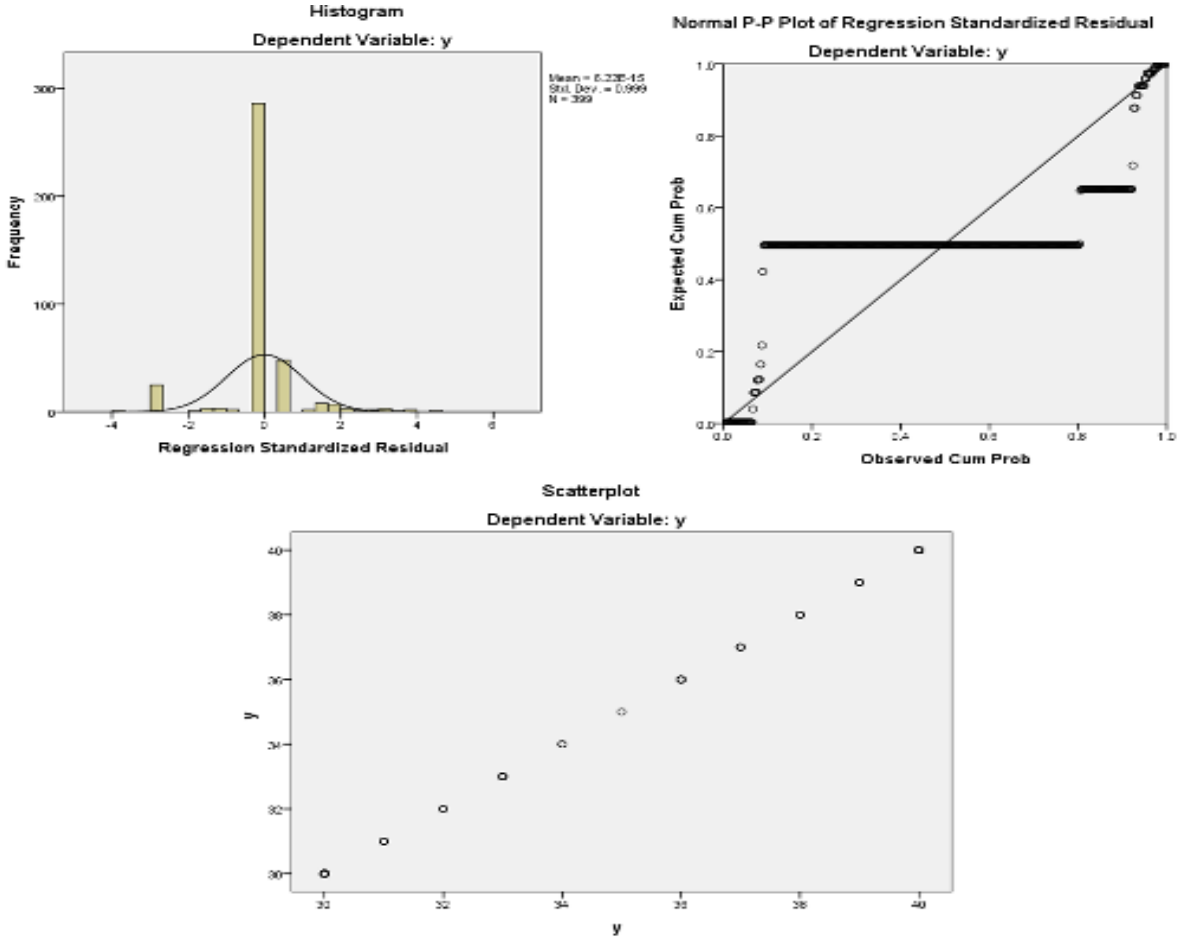

Figure 4: shows the regression relationship of the second hypothesis

15. Statistical Analysis and Empirical Results

The data resulting from personal interviews with programmers, which were collected during the period from June 2021 to January 2022, were analyzed, as interviews with 14 programmers were reviewed, and their years of experience in programming ranged between three and fifteen years, and most of the participants were working in the field of Software development for factories.

The benefits of using the agile software development were reviewed, emphasizing that fulfilling the requirements is useful for work and applicable in the field of work

The results that were extracted from the study showed that the organization, which operates in a dynamic and changing competitive environment, faces a high level of risk and uncertainty. For the business environment, which needs strong competitive capabilities to ensure sustainability and continuity of business, and these activities can be limited or prevented while protecting the organization from risks through an agile development methodology.

15.1 Research Contributions

The research contributes to providing a general idea of software development according to the agile development method. The traditional methods of software development are not able to meet the challenge of overcoming errors as one of the non-value-added activities, and there are many technical limits that restrict work in factories, in our case this is food factories. Through the research, it was possible to suggest many applications to develop the software development method in food factories according to the changing needs, as well as working to exclude errors as one of the non-value-added activities.

This research can provide an overview of agile development methods that can focus on value-added activities and how these activities can be directed to develop value-added through software development methodology in food factories. In this research, the focus is on the understanding of software users of the nature of work in software development, and a review of the practices associated with collecting requirements, and in the end, applications are developed using the agile development method based on user suggestions.

This method of software development is guided by a set of steps that ensures access to a sufficient level of preference in the design and the use of an effective application that satisfies all the requirements collected while trying to reduce or prevent errors as a non-value-added activity. Effective application of this method of development needs to build a clear framework as well as providing guidelines for determining requirements so that the program is implemented and tested in the appropriate environment.

15.2 Conclusion

Through the research, the feasibility of using the agile method in software development to reduce or limit the errors as non-value adding activities was evaluated. Officials in food factories and programmers participated in the research, and through personal interviews with them, it was possible to identify the benefits of using this method and its relationship to saving time wasters, as well as a survey was distributed to software users in factories and the resulting data was analyzed to analyze the research variables. The results of the analysis showed that there are many possibilities included in the agile software development method, through which software can be developed so that it is applicable, as well as limiting or preventing time wasters.

In the end, we find that introducing new activities for applications through flexible development is not easy, and programmers seek to facilitate the way of dealing with applications by sharing information with users of these programs.

There are many challenges that programmers may face from users not understanding many of the possibilities available through these applications and not benefiting from them. Therefore, users may need training and technical support when using these applications

15.3 Future Research

1. Investigate how to integrate software development methodology with risk reduction projects.
2. The future development of tools to overcome the threats that organizations may face from the external environment.
3. Evaluating the effectiveness of the flexible development method in improving the impact of software on production activities.

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APPENDIX: A

Questionnaire oriented to employees in the Food factories in Egypt

Note: Data on this Questionnaire is confidential and used only for the purposes of scientific research

Gender: Male [] Female []
Age: 20 -30 [] 30-40 [] 40-50 [] 50 and above []
Employment: IT worker [ ] Researcher [] administrative [] Other []
General experience of using software: From three to five years [ ] From six years and over []
Powers of access to data through the information system: Full access to information [ ] Partial powers of access to information []
The relationship of the applications used to the production run: direct basic relationship [ ] indirect relationship []
Please draw a circle on the selected number note that each number corresponding equivalent item in the following table

Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
1	2	3	4	5

Software agile development method application

serial	statement					
1	Workers share information with programmers to achieve optimum results through agile development	**1**	**2**	**3**	**4**	**5**
2	Agile development is obtained from several different sources.	**1**	**2**	**3**	**4**	**5**
3	The various models that programmers design using agile development are monitored	**1**	**2**	**3**	**4**	**5**
4	Application properties can be improved by excluding errors as non-value-added activities.	**1**	**2**	**3**	**4**	**5**

5	Information is shared with all participants in the application development project to ensure the success of the agile development process	**1**	**2**	**3**	**4**	**5**
6	Work is being done to solve problems in various productive fields through agile development.	**1**	**2**	**3**	**4**	**5**
7	All factory leaders and officials review agile development models.	**1**	**2**	**3**	**4**	**5**
8	The integrity and suitability of the agile models being developed are emphasized before they are applied.	**1**	**2**	**3**	**4**	**5**

Requirements planning component analysis

serial	**statement**					
1	Functional requirements are achieved through agile development	**1**	**2**	**3**	**4**	**5**
2	Non-functional requirements are achieved through agile development	**1**	**2**	**3**	**4**	**5**
3	The requirements are monitored and re-adjusted according to the needs of the users	**1**	**2**	**3**	**4**	**5**
4	Application improvements are monitored by fulfillment of requirements	**1**	**2**	**3**	**4**	**5**
5	The results of the work are compared through the applications with what was planned to be achieved in them	**1**	**2**	**3**	**4**	**5**
6	The achievable requirements are estimated before they are planned.	**1**	**2**	**3**	**4**	**5**
7	The possibility of errors as non-value-added activities occurring is monitored and requirements are adjusted accordingly.	**1**	**2**	**3**	**4**	**5**

Eliminating errors as non-value added activities

serial	**statement**					
1	Through agile development, errors are minimized	**1**	**2**	**3**	**4**	**5**
2	Through agile development, defects caused by errors are minimized	**1**	**2**	**3**	**4**	**5**
3	Through agile development, waiting times caused by errors are reduced	**1**	**2**	**3**	**4**	**5**
4	Through agile development, iterations caused by errors are reduced	**1**	**2**	**3**	**4**	**5**
5	Through agile development, work disruptions caused by errors are minimized	**1**	**2**	**3**	**4**	**5**
6	Through agile development, unnecessary processing caused by errors is reduced	**1**	**2**	**3**	**4**	**5**
7	An appropriate working environment is created to ensure that errors as non-value-added activities do not occur	**1**	**2**	**3**	**4**	**5**
8	All available capabilities are employed to ensure that no non value-added activities caused by errors occur	**1**	**2**	**3**	**4**	**5**

1) What are the advantages provided by the use of Software agile development method?

-

-

-
-
-
-

2) What are the disadvantages of the Software agile development method?

-
-
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-
-
-

3) What are the policies and procedures that must be followed by the organization to overcome the disadvantages of the Software agile development method?

-
-
-
-
-
-

APPENDIX: B interviews with food factory managers

The application of the 12 Principles behind the Agile Manifesto in food factory

Serial	Principle	Application of the principle in food factories	Applied	Not Applied
1	Our highest priority is to satisfy the customer through early and continuous delivery of valuable software.			
2	Welcome changing requirements, even late in development. Agile processes harness change for the customer's competitive advantage.			
3	Deliver working software frequently, from a couple of weeks to a couple of months, with a preference to the shorter timescale.			
4	Business people and developers must work together daily throughout the project.			
5	Build projects around motivated individuals. Give them the environment and support they need, and trust them to get the job done.			
6	The most efficient and effective method of conveying information to and within a development team is face-to-face conversation.			
7	Working software is the primary measure of progress.			

8	Agile processes promote sustainable development. The sponsors, developers, and users should be able to maintain a constant pace indefinitely.			
9	Continuous attention to technical excellence and good design enhances agility.			
10	Simplicity--the art of maximizing the amount of work not done--is essential.			
11	The best architectures, requirements, and designs emerge from self-organizing teams.			
12	At regular intervals, the team reflects on how to become more effective, then tunes and adjusts its behavior accordingly.			

APPENDIX: C INTERVIEW APPLICATION FORM (interviews with food factory IT users)

1. Show how a combination of experiences and interchange of best practice in all areas of agile software development methodology may decrease errors as non-added value activity
2. Could agile software development methodology prevent errors as non-added value activity
3. What an agile software development methodology may give possibility to improve the whole production system

APPENDIX: D Observation FORM

What are the Practical observations of the effects of the development processes at IT department in food factories may change:

1. The plan
2. The contract agreement with supplier or third parties
3. Tools and processes
4. Documentation

APPENDIX: E Observation FORM

The use of agile software development methodology to reduce or prevent errors and their impact on:

The components

1. Detailed **documentation** of work mechanisms in software development and regular follow-up of the application of agile principles
2. **Direct response** to changes that may occur as a result of applying agile in a systematic manner
3. Follow up the implementation of the pre-determined **plan** and deviate from it, taking into account the ability to respond to change.
4. Direct the **processes and tools** with which people interact in a more effective manner
5. Include all binding clauses in the **contracts** that are documented and that govern the relationship with consumers.

The changes

1. Determining **the techniques** used in software development.
2. Coverage of the extent to which changes are applied according to the **requirements**, whether functional or non-functional, from bottom to top or from top to bottom.
3. The properties to be changed include **all or parts** of the process.
4. Estimate the **efforts** required in the development processes and constraints with the most realistic costs and the time required to make those changes.
5.

The improvements

1. Expansion of the use of software applications.
2. Reducing the time required to reach the final product.
3. Reducing errors in software as one of the non-value-adding activities.
4. Software users' interaction with computers
5. Respond to changes according to business needs.