Teamwork for Decision-Making Through Games: The Case of On-Line "Manage-Art"

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ABSTRACT

Decision-making is a process that involves all people and is critical in everyday situations, not only in companies and organizations, but also in people´s personal life. Most of the time decisions are influenced by external variables such as time, participants, amount of knowledge, possible results, available resources, specific situations, among others, that can skew the decision-making process; therefore organizations form working groups to stimulate discussion and analysis, to obtain an efficient decision-making process that leads into successful decision. However is difficult to teach its importance through conventional learning tools. This paper proposes the on-line game ***Manage-Art*** *to determine the affectivity in group decision making versus individual decisions in daily situations, presenting description, validation and results of the game.*

INTRODUCTION

Games are used in recent years as a training and learning tool in different scenarios such as schools, universities and organizations; and Echeverría et al. (2011) suggest that the use of video games as educational tools is slowly becoming an accepted practice in learning environments, achieving at least one of the following purposes of a game (Gómez, 2010): Teaching, reinforcing, verification, measurement, creations development or socialization experience.

Kebritchi & Hirumi (2008) proposed that educational games are effective teaching tools for hard and complex procedures because:

- Use action instead of explanation.
- Create personal motivation and satisfaction.
- Accommodate multiple learning styles and skills.
- Reinforce mastery skills.
- Provide interactive and decision making-contexts

Similarly Ben-Zvi (2010) argues that games present an effective alternative to traditional teaching methods because they provide a link between abstract concepts and real world problems, however the key to success is to reach a balance between fun and learning in a game (Moreno-Ger *et al*, 2008).

Design and validation of games with educational purposes must incorporate an educational dimension, which defines how to build and integrate the game as a learning tool, and a ludic dimension, which determines how to create an engaging and fun experience (Echeverría *et al.*, 2011). Unfortunately, this is not easy because game design is not a precise science, which is mostly due to the subtle nature of fun (Moreno-Ger *et al*., 2008).

Games objective is to offer students the opportunity to learn by doing, engaging them in a simulated experience of the real- world, to immerse them in an authentic management situation (Ben-Zvi, 2010); this can help students achieve not only technical capability, but also a managerial perspective of problems which are important motivational and learning tools that present a novel approach for teaching decision making (Ben-Zvi, 2010), managerial capabilities and general concepts of different fields of study.

This way playing games is increasingly linked to learning and distinct learning outcomes that playing digital games can have had been identified (Connolly *et al.*, 2012):

- **Cognitive outcomes:** including declarative, procedural and strategic knowledge.
- **Affective outcomes:** beliefs or attitudes.

Additional is important to mention that one of the main bases to construct and design games is the game theory that deals with the study of choice when decisions depend on others, under some rational arguments and known and given restrictions (Plata, 2008).

This paper presents the on-line game ***"Manage-Art",*** an educational game to reinforce some special topics related to decision-making process individually and by

teams. This game aims to show participants the importance of decision-making process in companies and the way it becomes a key successful factor for effective teamwork (Rojas, Alis & Londoño, 2012).

The paper is organized in sections as follows: In section 2 some basic concepts of decision-making process are shown as the central topic that the game aims to reinforce. In section 3 the methodology, description and on -line environment of the game is presented. Later in section 4 a summary of the results of the game application are shown and in section 5 some conclusions are presented. Finally in section 6 some future work related to the game ***Manage-Art*** is described.

DECISION MAKING PROCESS

> *"Decision making is the study of identifying and choosing alternatives based on the values and preferences of the decision maker. Making a decision implies that there are alternative choices to be considered, and in such a case we want not only to identify as many of these alternatives as possible but to choose the one that best fits with our goals, objectives, desires, values, and so on"* (Fülöp, 2005).

Decision-making process takes place in people everyday situations and is critical because can influence positive or negative the activities of a hole company. A correct decision-making process can lead a successful business, but a wrong decision-making process may lead to bankruptcy. Over the past several years the use of groups and teams in organizations has grown significantly, focusing in the influence that groups have on decisions and the decision process (Moon *et al*., 2003).

Research in group decision making has discovered that, compared to individuals, groups sometimes make better decisions (Moon *et al*., 2003) and have tried to understand how people make decisions in real-world contexts that are meaningful and familiar to them (Moe, Aurum, & Dybå, 2012) by the use of simulation programs or games that allows participants to make decisions in controlled environments.

A general decision making process can be divided into the following steps (Fülöp, 2005):

- Define the problem.
- Determine requirements.
- Establish goals.
- Identify alternatives.
- Define criteria.
- Select a decision making tool.
- Evaluate alternatives against criteria.
- Validate solutions against problem statement.

There are three general levels of decision-making in organizations depending on the purpose of the management activity and they differ from one another in terms of information requirements(Moe *et al*., 2012).

- Strategic decisions: Related to organizational goals and objectives.
- Tactical decisions: Related to identification and use of resources.
- Operational decisions: Deal with ensuring effectiveness of day-to-day operations within the organization.

Is important to notice that decision-making process is also influenced by external variables such as information availability, experience of the decision maker, people who take part in the process and their educational level, among others.

Exhibit 1
Methodology used for the game design.

STEP	DESCRIPTION
1	Identify the theme
2	Establish the purpose
3	Identify the instructional objectives
4	Identify and define general concepts of the theme
5	Select candidate techniques
6	Select the appropriate technique(s) according to characterization
7	Incorporation of specific knowledge
8	Development of initial tests
9	Consolidation of the final version
10	Elaborate an evaluation survey

GAME MANAGE-ART

METHODOLOGY

The game ***Manage-Art*** was developed with a methodology proposed at the Universidad Nacional de Colombia, which consist of 10 fundamental steps to design games based on experiences, starting from the identification of the theme to testing and corrections of the final game version (Gómez, 2010). The steps of the methodology are shown in Exhibit 1:

The original game was developed and validated with the mentioned methodology; then it was adapted in an on-line environment but maintaining the same structure.

Some of the characteristics of the game are shown in Exhibit 2 (Rojas, Alis & Londoño, 2012).

DESCRIPTION OF THE GAME

The game ***Manage-Art*** was designed in 2010 as final work of the postgraduate course "Management games", offered in the Universidad Nacional de Colombia, School of Mines. The game was initially designed as a face to face game, were participants have the opportunity to see their peers and discuss with them the best sequence. In 2011 the game was adapted in an on-line environment, with the same principles, rules and objectives of the original game.

The purpose of the game ***Manage-Art*** is to determine the affectivity of individual decision making versus group decisions in daily situations. The game scenario is a specific situation of a company in crisis, with different characteristics that players have to take into account to make decisions, first individually and then in teams.

The possible decisions or alternatives to solve the problem are given, and the goal of the game is to determine the sequence of alternatives, in an importance order, that could save a company in the specific situation. The optimal sequence of alternatives was determined by a group of four professors, experts in the fields of management, finance and strategy planning of the Universidad Nacional de Colombia.

PROCEDURE

The game starts by reading the scenario of the game and the different alternatives that participants can choose. Exhibit 3 shows the on-line environment of the game and the scenario for which participants will need to make decisions.

Participants must establish a sequence of alternatives that could solve the problem of the given situation. The alternatives of solution are given in the cards (A to J), and participants can consult the alternatives at any time of the game by doing a double click on each card.

To establish the sequence, participants have to move the cards into the empty spaces (1 to 8) being number 1, the first alternative to be done to solve the problem. Two of the given alternatives should not be used. This is an individual phase, and participants have 15 minutes to establish their own sequence. Exhibit 4 shows how the alternatives are sequenced by participants.

After the individual phase, participants are organized randomly in teams of 4 people and have 10 minutes to discuss and analyze the given alternatives and the individual sequences, in order to obtain a common solution to the given situation. Communication between participants is done through a chat. The Exhibit 5 shows the on-line environment in which participants determine a sequence of alternatives by teams.

The environment of the team phase shows the moves of all team members, but each participant can only manipulate his space. In the center of the screen the sequence of the group is shown, and it is determinate by consensus, that is, an alternative is established in a position of the group solution if the mayor part of the team members has the same alternative in the same position.

If one of the team members abandons the game, it continues with the other participants and they establish the sequence.

Individual and group results of the game are collected and entered into a matrix that qualifies the sequences when compared with the optimal. To obtain the results of the game a system of points was developed, with the purpose of obtaining a winner participant and a winner team during the game (Rojas, Alis & Londoño, 2012).

Exhibit 2
Characteristics of *Manage-Art*.

THEME	Decision-making process as a fundamental procedure in companies and in teamwork.
PURPOSE	Teach the importance of the decision-making process in companies and the value of teamwork in decision-making.
INSTRUCTIONAL OBJECTIVES	• Identify the importance of decision-making process in team-work. • Compare the efficiency of individual decisions versus group decisions. • Establish patterns of decision-making process in team members. • Show the influence of some team members in decision making-process.

Exhibit 3
On-line environment of *Manage-Art*.

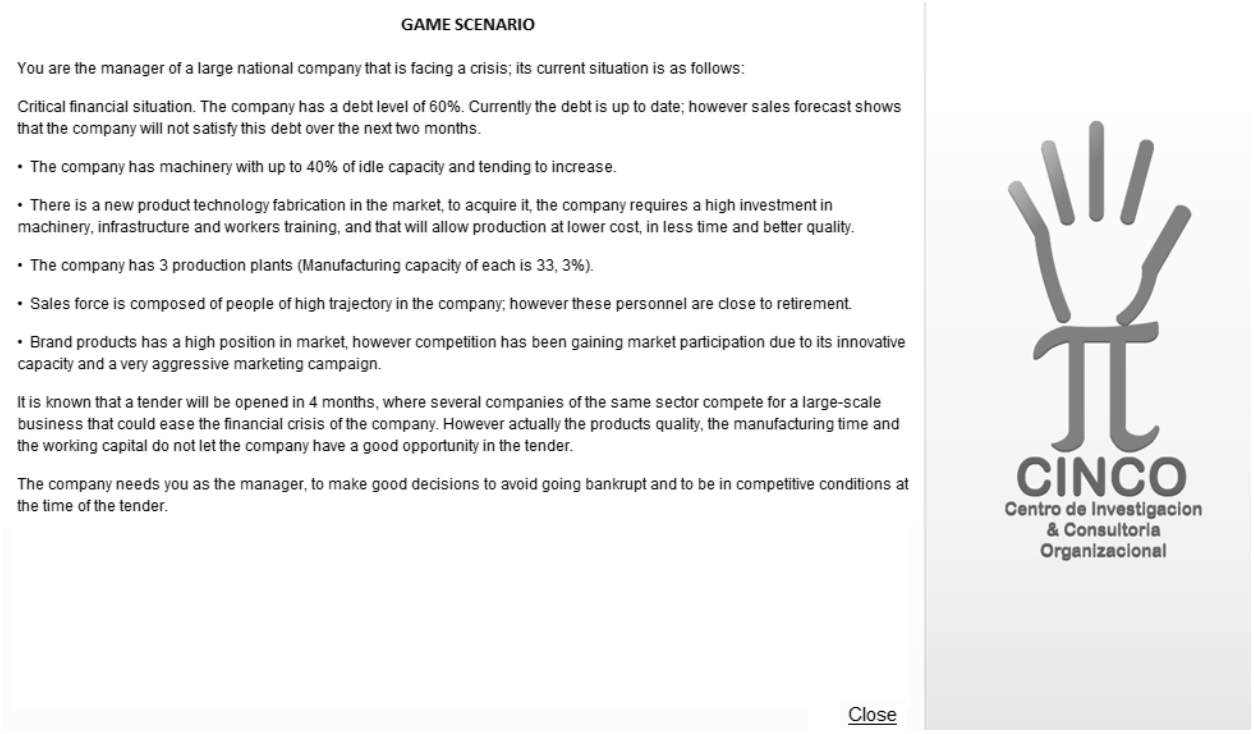
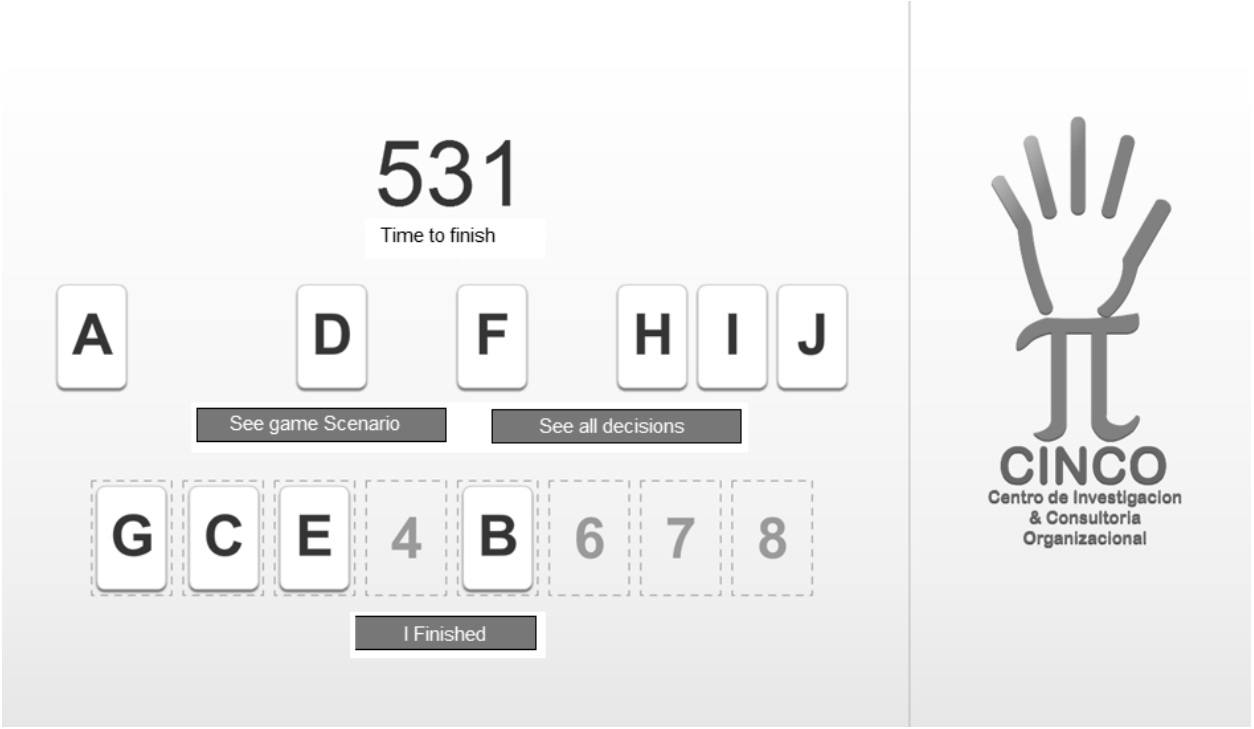


Exhibit 4
Individual phase of *Manage-Art*.



For each correct answer will be given 5 points, if the answer is a place above or below the correct answer will be given 3 points and if the answer is 2 places above or below the correct answer will be given 1 point. The maximum score of the game is 50 points, 5 points for each correct answer, and it corresponds to the optimal sequence (Rojas, Alis & Londoño, 2012).

Finally individual, collective and optimal results are compared to establish differences, make a feedback and obtain conclusions of the individually and team decision making process (Rojas, Alis & Londoño, 2012).

GAME OUTPUTS

The game in its on-line version has been applied 3 times to different groups of students in the Universidad Nacional de Colombia. Exhibit 6 shows the characterization of the groups in which the game has been applied.

Results obtained in each test of the game are shown in Exhibit 7 shows the outputs of the three test of the game. The lines show individual and group scores of each participant and the average of the individual results.

In the final part of the game a feedback with participants is done; individual results are shown and analyzed, so each participant knows his performance, then group results are exposed and everybody can see the evolution in the decision-making process. In the tests is possible to observe that in most of the cases the decision-making process is improved by team work.

Exhibit 8 shows a comparison between the final scores of the test of the game. In all the tests the best individual score were overcome by best group score and similarly, the worse individual score were overcome by worse group score. In general terms groups' results were higher than individual results.

In Exhibit 9 the performance of participants is exposed. It shows percentage and amount of participants that improve individual decision-making process through team work.

Exhibit 5
Group phase of *Manage-Art*.

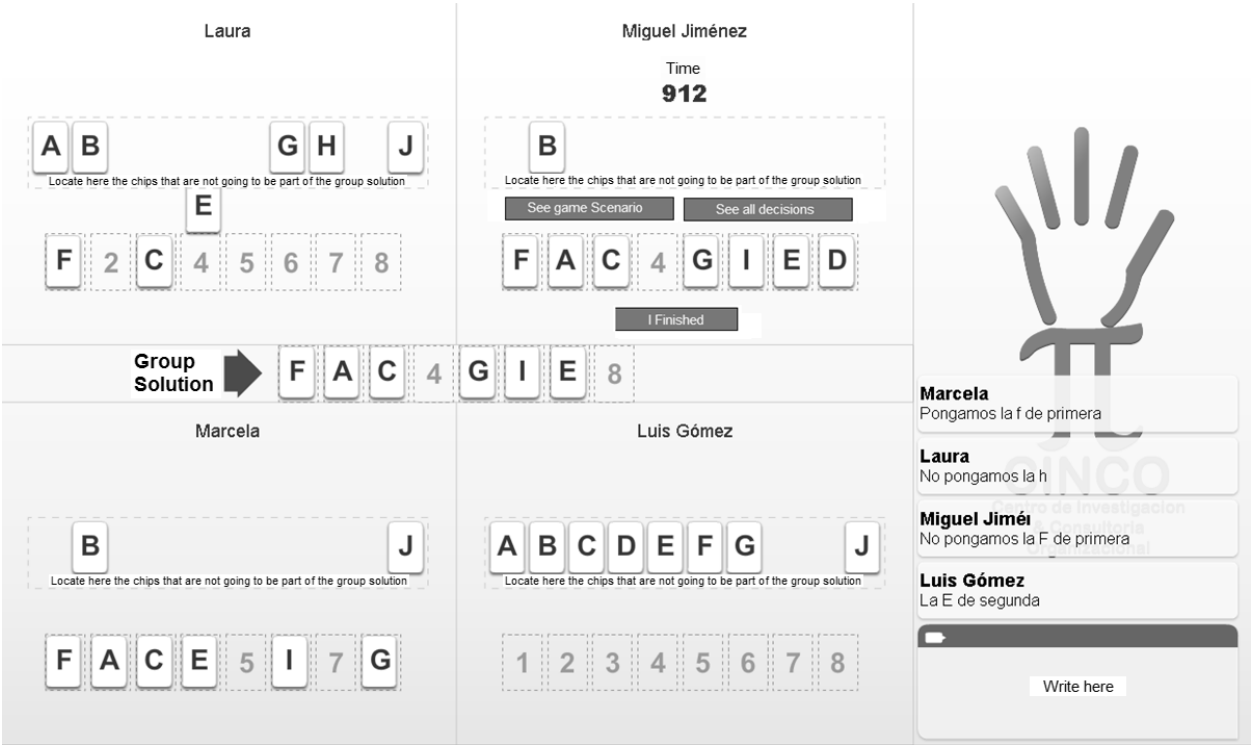


Exhibit 6
Information of participants.

TEST	COURSE	NUMBER OF PARTICIPANTS	DESCRIPTION
1	Management games	21	Postgraduate curse
2	Management theory	20	Undergraduate curse
3	Management games	20	Postgraduate curse

Between 75 and 80 % of participants improved their individual decisions by working in teams; between 10% and 20% of participants did not improve in group decision-making process, and 4,8% to 10% of participants stayed the same. Initially is possible to infer that group decision-making process is more efficient that individual.

CONCLUSIONS

As an alternative to traditional learning tools used in classrooms, the on-line game ***Manage-Art*** is proposed as a new training tool to teach the importance of team decision-making process and show the efficiency of teams versus individuals.

The application of the game allows participants to take part of a decision-making process, first individually and then by groups, giving them the opportunity to discuss, share experiences, analyze specific situations, identify failures and obtain a feedback, that leads to a better decision-making process and consequently to better results.

Participants expressed that they got better results because experience, discussion, arguments and all the decision making process of the team convinced them of a better sequence and allow to reach an agreement with the other team members.

The results shown in this paper are initial tests of the on-line game ***Manage-Art,*** therefore is not possible to obtain precise conclusion about the participants or the game. However with the application was possible to easily identify an important improvement in individual decision-making process through teams and determine team and members.

The game is a potential tool to diagnose the functionality of teams, identify failures and adapt them to specific company's situations that needs a group of experts that work in a synergic way to solve problems.

FUTURE WORK

Some of the future work to be done with the on-line game ***Manage-Art*** is:

- Apply the game to different groups of people in order to validate the initial results and obtain patterns of behavior to infer characteristics of the team members.
- Determine which type of group is better taking decisions (Groups of women, groups of men or mixed groups).
- Create new scenarios of the game that allows it to be applied to people of different fields such as health, agriculture, and mining, among others.
- Establish the game as a tool to diagnose the functionality of teams, identify failures and adapt them to specific company's situations.

Exhibit 7
Output of the three tests of *Manage-Art.*

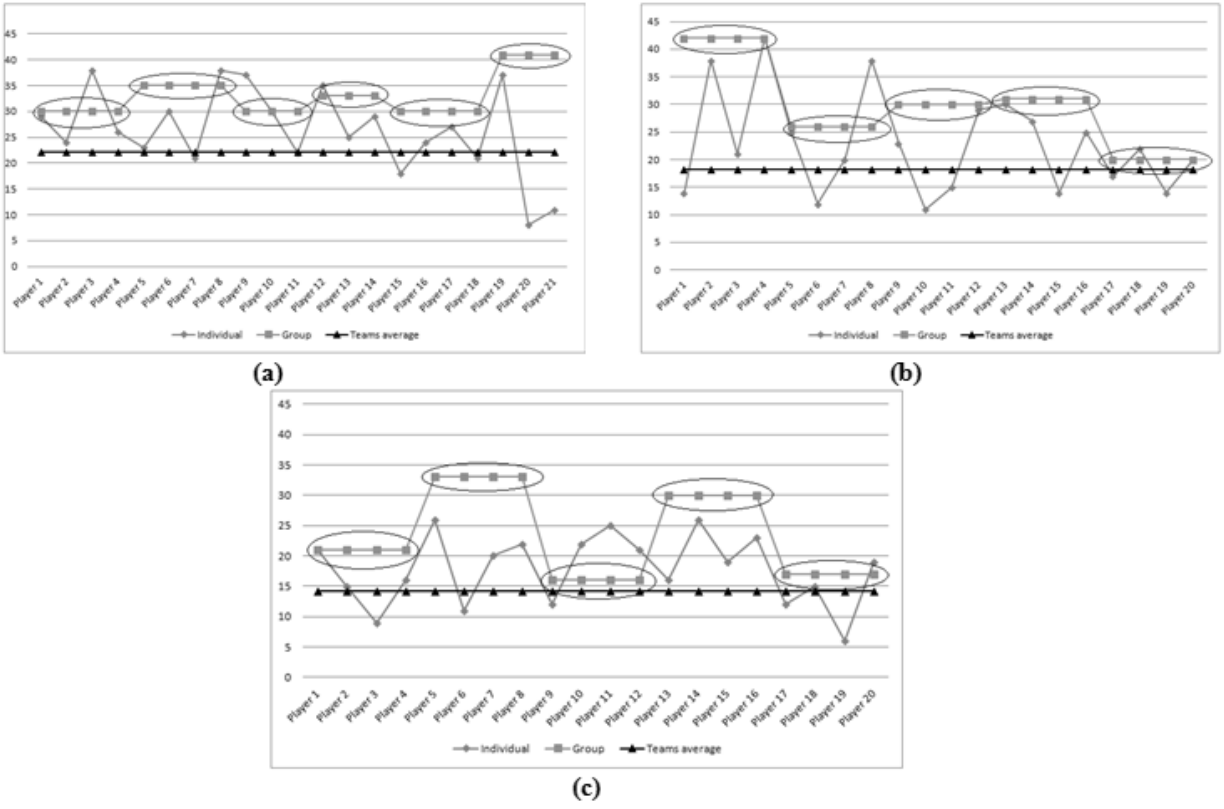


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Exhibit 8
Test scores comparison.

	FIRST TEST		SECOND TEST		THIRD TEST	
	Individual	**Group**	**Individual**	**Group**	**Individual**	**Group**
Best score	38	41	42	42	26	33
Worse score	8	30	11	20	6	16
Total Average	22,12		18,28		14,24	

Exhibit 9
Improvement of test scores.

	FIRST TEST		SECOND TEST		THIRD TEST	
	Participants	**Percentage**	**Participants**	**Percentage**	**Participants**	**Percentage**
Improved	16	76,2%	16	80%	15	75%
Not Improved	4	19%	2	10%	4	20%
Stayed the same	1	4,8%	2	10%	1	5%