

# Unsupervised Interactive lecture evaluation using the Kano Model

Baghdadi Ammar Awni Abbas1\*

University of Baghdad, College of Mass Media Baghdad, Iraq.

Najeeb Abbas Al-Sammarraie †

Al Madinah International University Kuala Lumpur, M Malaysia

Mohammed Al-Mukhtar ‡

Computer Center, University of Baghdad, Baghdad, Iraq.

Maha Abdulameer §

University of Baghdad, College of Mass Media Baghdad, Iraq.

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## Abstract

Interactivity is the most critical factor in effective e-learning in web-based learning environments. This paper presents an interactive lecture course for undergraduate students built using MATLAB AppDesigner from scratch. The subject of the lectures was the computer network. The system was presented to a second-year College of Mass Communication/Baghdad University. A questionnaire was deployed for the students, according to the Kano model, to measure their students' satisfaction with the interactive lectures and their future expectations for such a type of lecture to be used systematically as a supplement to the ordinary lecture. Kano Model Analysis was used to measure students' satisfaction with the interactive lectures. The results showed that interactive lectures have great potential for satisfying students' learning needs. The suggested lectures may serve as a backup for the ordinary lectures, or as a training and testing method for students. All types of materials, scientific or social, can be taught in this manner. Keywords: Interactive lecture, e-learning, Kano model, Matlab AppDesigner, Learning Management System.

## 1 Introduction

Interactivity is the ability to use some functions or activities for those functions or operations that are accessible to the users, which allows them to utilize the content provided in a graphical user interface of the software and obtain feedback. Interactive lectures were divided into the following categories: 1- Supervised Interactive lecture: The lecturer has direct contact with students via an interactive device such as a tablet, telephone, computer, or voting device 2- Unsupervised Interactive lecture: The lectures are designed and programmed previously with a fixed material and tests

Both of the previous types are considered interactive; the former induces brainstorming and discussion, while the latter is more time-flexible and generates self-learning. The main techniques used in interactive learning models are brainstorming, discussions, debates, multimedia (audio and video) web interference, projects, and games. Interactive lectures help students learn, develop their critical thinking and analytical skills, set logical connections, and make decisions with the necessary arguments. Interactive lectures induce self-learning, communication skills (supervised), and creativity, thereby improving the quality of the material. However, it requires high personal adaptation skills and high Teacher Qualifications and skills, which may create psychological discomfort. The Kano model is an effective scheme for any product maker who wants an efficient method to compute and prioritize product features. This is a useful tool for enhancing any product or service. The Kano model was presented by Noriaki Kano in a paper published in 1984 at Tokyo University of Science. Enhancing popular features and complaint processing are ways to improve and maintain customer loyalty. However, Professor Kano wanted to find out if there were other ways to improve that matter. According to his hypothesis, customer loyalty depends on five types of emotional responses to product features. By experimenting with a sample of selected participants, he was able to create a reaction graph (Table 1) to anticipate the emotional responses, on which he proved that customer satisfaction relies on the complexity of an available function, which causes more emotional responses. The Kano model can be used to measure customer satisfaction and increase it, determine if the current features cause high customer satisfaction, and enhance the current feature to an optimal level. Kano analysis is performed when resources and time are limited, which can save money and identify priority areas in a product that need attention because it is underperforming.

\*University of Baghdad, College of Mass Media Baghdad

†Al Madinah International University Kuala Lumpur, M Malaysia

‡Computer Center, University of Baghdad, Baghdad, Iraq.

§University of Baghdad, College of Mass Media Baghdad

## 2 RelatedWork:

Interactive lectures have been the subject of many papers for two decades, and with the widespread use of personal handheld devices such as mobile phones and tablets, the subject has acquired great momentum. [1] Give essential building blocks for programming questions in MATLAB. [2] Propose an interactive lecture method was proposed using the CDEARA model. [3] presented a blended learning model that can accurately forecast how blended learning will be employed in the event of a pandemic. [4] Introduce A framework for collaborative mobile learning that can be used to create mobile learning environments that incorporate free-to-use social networking, software, and communication tools. The [5] study investigates the variables that influence students' intent and preparedness to use mobile learning in Jordanian higher education. Researchers have examined the needs and interests of students regarding the design and implementation of m-learning. The literature on E-learning systems has been reviewed intensively and a comprehensive model is made to evaluate the learning system degrees of achievement concerning several different success factors[6]. [7]Compare didactic lectures with interactive lectures for learning enhancement in third- year BDS students at Nishtar Medical University, Multan, and conclude that"interactive lectures are more popular and beneficial than didactic lectures".[8] Uses Matlab to grade multiple-choice questions in paper- based exams.[9] Presents a mixture of quantitative and qualitative surveys to find gaps and patterns in the literature relating to blended mobile learning in education.[10] Discovers that the dynamic trajectories shown in Kano's model are useful for mid-term customer preference prediction and are partially confirmed. [11] explains a project in progress to create computer science courseware modules that are accessible via the World Wide Web and incorporate interactive elements within the curriculum, to increase student interactivity. In [12] the unified theory of acceptance and use in technology (UTAUT) model was used to perform a descriptive and regression analysis on the feasibility of mobile recognition of the need to address inadequate infrastructure and limited access to high-quality education. The interactivity of course-management systems (CMS) has been explored, focusing on Taiwanese students' perceptions, uses, and evaluations[13]. In a study[14] they used the Kano Model and a "relationship marketing perspective" to suggest an approach for creating an online "non-academic" course that can lead to "student satisfaction".[15] used a voting system to increase interactivity between lecturers and students.

The Kano model with Quality Function Deployment was used to identify customer needs [16]. This study examines the effects of using an interactive board, Bluetooth broadcasting system, voting system, notepad, free Internet access, computer-based exams, and interactive classroom technology in modern classroom technology [17]. This chapter examines the emergence of mobile learning initiatives and their contributions [18].[19] Describes the use of interactive learning in developing

countries. (UTAUT) model to investigate students' behavioral purpose in implementing and utilizing mobile learning in postsecondary education in East Africa[20]. In [21], the authors reviewed the entire spectrum of interactive lecture formats and highlighted the severe dearth of research that can guide considerations of what is a very popular teaching method in higher education. By asking students about their opinions on the use of interactive video lectures in online classrooms, the effectiveness of the engagement opportunities provided by the virtual classroom was evaluated. [22]. In[23] a wireless interactive learning device was used to provide desktop devices with greater transformative potential. There was good acceptance of interactive teaching among students when compared to traditional didactic lectures [24]. In [25] a precise description of dynamic interactive systems is given. In [26] researchers introduced a new teaching paradigm based on Ubiquitous Computing to increase the interactivity between students and teachers, and the outcomes revealed a notable rise in interactivity due to the use of this method. A course at Eotvos Lorand University, Budapest, was presented. The main aim of this course is to raise the understanding of participating lecturers about how to make their lectures more memorable[27].[28] Create Clicker questions as a form of interactivity, the student can see an explanation of why the answer is correct or wrong. In[29] a comparison was made between the utility of modified versions of the unified theory of acceptance and use of technology (UTAUT) for mobile learning adoption in a developing nation's education (Guyana). [30] Examine medical education technology applications with an emphasis on interactive learning. In [31], a voting device was used, and a two-year study concluded that interactive lectures are the most promising approach for teaching. The Kano model is used to measure the degree of satisfaction of students using a virtual 3D medical device [32], and the results showed that these types of devices can induce positive satisfaction by learners. The Kano model is used to evaluate student satisfaction with an interactive medical device called a virtual 3D electroencephalogram [33]. A thorough model and tool to gauge student satisfaction with asynchronous e- learning systems were created in this study. The methods for designing the questionnaire, creating the items, gathering information, and verifying the multiple-item scale have been explained [34].

Interactive lectures were built using MATLAB AppDesigner. The lecture had a very simple introductory interface, as shown in Figure (1). Students can choose any lecture to attend or go directly to the testing pages.



Figure 1: Graphical user interface for the lectures

The user can go from the main window to the lectures in Figure(2), where he can choose the part that he can study, or he can take the exam directly as shown in Figure (3).

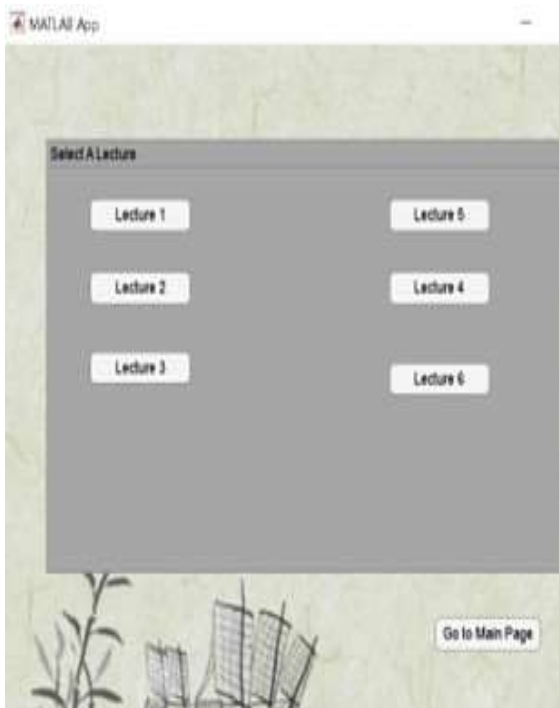


Figure 2: Lecture interface



Figure 3: Take Exam.

When a student selects a lecture the first slide of the lecture appears. The slides range from simple text- only slides (Figure (4)) to complicated slides containing hyperlinks to a video or a website Figure(5(a)); pressing the pushbutton in that figure will lead to displaying the video shown in Figure(5(b)).



Figure 4: simple text-only slides.



Figure 5: Slides containing hyperlinks

All the slides have common features that include a push button, which leads to the previous slide; 2-Next push button, which leads to the next slide; 3- Take a Quiz push button, which leads to the end of the chapter exam directly without passing through the rest of the slides; and 4-Optional push buttons to display a video, audio or open a website. To create interactivity in the slides in each lecture (which normally consists of 15 - 35 slides), have a small quiz every 1-3 slides. The quiz types are Multiple Choice Questions, True or False, and Fill the Blank as shown in Figure 6 (a,b, and c). The most

popular forms of questions were programmed using MATLAB AppDesigner[34],[35].

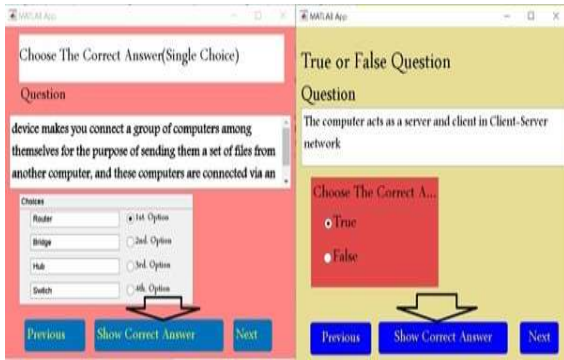


Figure 6



Figure 7: Pressing the Show Correct

However, the end of the chapter test contained Essay questions, where the answer appeared in a message box, as shown in Figure (8).

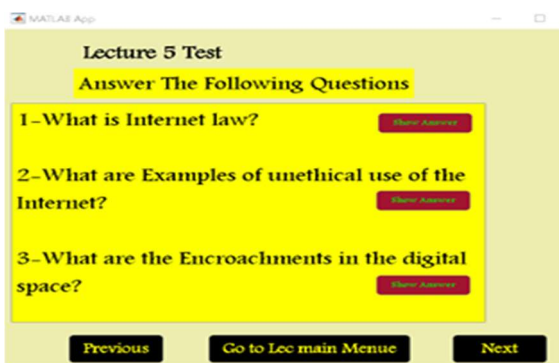


Figure 8: Essay Questions.

The Lectures were built using MATLAB AppDesigner and, and divided into six chapters. The lectures covered the material for the first semester of computer science for second-year students in the Department of Radio Television /the College of Mass Communication. An executable file was shared with students in Google Classroom. Upon completion of

the course, the students completed a questionnaire. Each aspect of the interactive lecture properties was stated as a functional/dysfunctional pair. The Kano model analysis was depicted on the system to measure the satisfaction of the students (or customers according to the Kano model) with the product( the interactive lectures).

**Kano Analysis Model:** Any analysis process must undergo three stages, First: Selecting features, themes, and users for analysis; second: Obtaining the best information from customers and Third: Analyzing the results. Many researchers have exploited the flexible nature of the Kano analysis model to measure the degree of satisfaction of their customers. Software products, such as any product, have all the aspects that make them a good candidate to be subjected to the Kano model as a satisfaction-measuring tool. The students were considered the final customers as in[4]. The quality dimensions and items (themes) of interactive lectures can be categorized into (System Features, Learner interface, Personalization, and Future Enhancement)[21], as follows:

**System Features(SF):**

- 1- Stable system.
- 2- Work offline.
- 3- Unsupervised, no direct interaction with the teacher, promotes self-learning.
- 4- Bilingual GUI, choose from two languages(English and Arabic).

**Learner interface(LI):**

- 1- There are many forms of questions at the end of the lecture, such as Essay questions multiple choice questions (single and multiple selections), and true or false questions.
- 2- Multimedia(video ,audio and web hyperlinks) to support the slides.
- 3- Scrambled answers each time you open the lectures

**Learner Community(LC):**

- 1- The learning system makes it easy to share what you learn with other students.
- 2- The learning system makes it easy to share what you learn with your teacher

**Personalization(P):**

- 1 - Easy to choose what you want to learn.
- 2-Choosing the time I want to learn.
- 3- Easy to choose how much you want to learn.

**Future Enhancement(FE):**

- 1-New Forms of questions like matching hot spot.
- 2-Certificate for the final test.
- 3-Slides have audio recordings for the original text.

4-System work on multiple platforms (PC, Tablets, and smartphones).

A Google Form questionnaire containing functional and dysfunctional features was created. The form was distributed to second-year undergraduate students from the Department of Radio and Television /College of Mass Media/ University of Baghdad(who tested the software) and they were asked to answer them. These students were introduced to the interactive lectures as part of the materials of the first semester in computer techniques class( along with the other classes). The Multiple Choice Questions options measure student satisfaction. The responses ranged from Delighted (having full satisfaction) to Frustrated. Between these two are (Satisfied, Neutral, and Dissatisfied) values to measure the exact rate of satisfaction. From the previous theme, a questionnaire containing functional and dysfunctional features was created as follows:

#### **System Features(SF):**

1- Stable system. Functional: How would you feel about having a stable system? Dysfunctional: How would you feel about having an unstable system with pauses and glitches?

2- Work offline. Functional:

How would you feel about having the system working offline? Dysfunctional: How would you feel about having the system working online only?

3- Unsupervised, no direct interaction with the teacher, promotes self-learning. Functional: How would you feel about having the system be unsupervised, having no direct interaction with the teacher, and promoting self-learning? Dysfunctional: How would you feel about having the system supervised, with direct interaction with the teacher?

4- Bilingual GUI, choose from two languages(English and Arabic). Functional: How would you feel about having a system that works with English and Arabic language choices? Dysfunctional: How would you feel about having the system with a single-language GUI?

#### **Learner interface(LI):**

1- There are many forms of questions at the end of the lecture such as Essay questions multiple choice questions (single and multiple selections) and true or false questions. Functional: How would you feel if you had many forms of questions at the end of the lecture like Essay questions multiple choice questions (single and multiple selections), plus true or false questions?

Dysfunctional: How would you feel if you had only one form of a question at the end of the lecture(only multiple-choice questions for example)?

2- Multimedia(video ,audio and web hyperlinks) to support the slides. Functional: How would you feel about using Multimedia(video, audio, and web hyperlinks) to support the slides? Dysfunctional: How would you feel about not using Multimedia(video, audio, and web hyperlinks) to support the slides, (static text slides only)?

3- For MCQs the answers are scrambled each time you open the lectures. Functional: How would you feel about scrambling

the answers to the multiple-choice questions each time you open a lecture? Dysfunctional: 'How would you feel if the answers for the multiple- choice questions were static each time you open a lecture?

#### **Learner Community(LC):**

1- The learning system makes it easy to share what you learn with other students. Functional: Does the learning system make it easy to share what you learn with other students? Dysfunctional: This learning system does not make it easy to share what one learns with other students.

2- The learning system makes it easy to share what you learn with your teacher. Functional: Does the learning system make it easier to share what you learn with your teacher? Dysfunctional: The learning system does not make it easy for you to share what you learn with your teacher.

#### **Personalization(P):**

1- Easy to choose what you want to learn. Functional: Does the system let you easily choose what you want to learn? Dysfunctional: The system does not let you easily choose what you want to learn.

2- Choosing the time I want to learn. Functional: Does the system let you choose the time you want to learn?

Dysfunctional: The system does not let you choose the time you want to learn.

3- Easy to choose how much you want to learn. Functional: Does the system let you choose how much you want to learn? Dysfunctional: The system does not let you choose how much you want to learn.

#### **Future Enhancement(FE):**

1- New Forms of questions like matching hot spot. Functional: Do you want to add new forms of questions like matching hot spots? Dysfunctional: How would you feel if you had only the standard forms of questions MCQ T or F and Essay?

2- Certificate for the final test. Functional: Do you want to get a Certificate for each test? Dysfunctional: How would you feel if you didn't have a Certificate for each test?

3- Slides have audio recordings plus the original text. Functional: How do you feel if the slides have audio recordings that the teacher reads and explains the text in the slides? Dysfunctional: How would you feel if the slides had text only, without audio recordings from the teacher?

4- System work on multiple platforms (PC, Tablets and smartphones) Functional: How would you feel about having the system work on multiple platforms (PCs, Tablets, and smartphones)? Dysfunctional: How would you feel about having the system work on a single platform (PC alone)?

#### **Results:**

The collected questionnaire answers were subjected to the Kano evaluation table as shown in Table(1). The table joins

together the functional/dysfunctional answers in its rows and columns to obtain one of the Kano categories (Attractive(A), One Dimensional(O), Must be(M), Indifferent(I), Reverse(R), Questionable(Q)). Each answer pair leads to one of these categories.

The last two columns (Better/Worse); Where the Better represents the degree of customer satisfaction if the feature is present, and the Worse presents the degree of dissatisfaction if the feature is absent.

### 3 Discussion

The features selected in this paper were chosen by the author after a thorough discussion with the students and many members of the faculty of colleges at the University of Baghdad. Three categories were of top priority to students (Easy to choose how much you learn, the multiple platforms for the lectures, and Multi-lingual GUI). These features had a value of nine(Top Priority) for more than half of the students. Not surprisingly choosing how much you want to learn represents the essence of the unsupervised part of the unsupervised interactive lectures where the students can learn any part of the lecture at any time. On the other hand, having to choose the device for learning from three options (PC, Tablet, and Mobile phone) resulted in the ability to change the user from Arabic to English.

According to the Kano evaluation table, the ability to choose what to learn with bilingual GUI categories is considered attractive(Delighters or Exciters) by the students, because of the positive reactions felt by them. The multiple platform is considered a performance or one-dimensional category (where the more you have from these categories the more the customer is satisfied). Most of the other categories are considered indifferent to the students, such as scrambling the answers or the ability to share what they learn, mainly because the students are new to this type of education. The table also marks the absence of the must-be category, which occurred due to the formation of the questionnaire, where the questions were designed to be as compact as possible so as not to distract the students and get their full attention without boring them. Most of the answers are categorized as indifferent, which is mainly due to the infrequent use of this type of lecture by the students.

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**Table (1): Kano Evaluation Table.**

**Dysfunctional(Feature absent)**

Functional(Feature present)	Like it	Dysfunctional(Feature absent)	Dysfunctional(Feature absent)	Dysfunctional(Feature absent)	Dysfunctional(Feature absent)	Dysfunctional(Feature absent)
		Q	A	A	A	P
Expect it	R	I	I	I	M	
Don't care	R	I	I	I	M	
Live with	R	I	I	I	M	
Dislike	R	R	R	R	Q	

The questionnaires were asked to give a value for how important categories are to them on a scale from one to nine, where nine denotes the category is extremely important and 1 is not at all important. The results of this part of the questionnaire are shown in the figure(9).

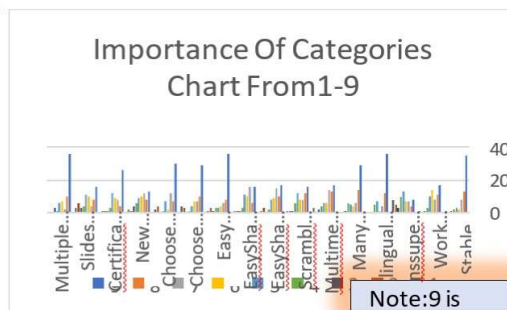


Figure 9: category importance

Item Categories	65	6	17	0	18	23	1	A	64	0625	-37.8
1)TABLE SYSTEM	65	0	20	4	7	34	0	A	87	2131	14.75
2)WORK OFFLINE	65	0	47	13	9	7	0	I	4	69	932653
3)UNSUPERVISED	65	1	20	0	14	28	2	A	66	68668667	-23
4)BILINGUAL LANGUAGE	65	3	22	5	10	24	1	A	57	62771894	-22
5)MANY FORMS OF Q	65	1	34	1	5	24	0	I	46	41705	-9
6)MULTIMEDIA SUPPORT	65	1	40	6	8	11	1	I	29	31234480	-12
7)SCRAMBLED ANSWER	65	2	38	2	8	18	1	I	38	75877425	-18
8)EASY SHARE WITH STUDENTS	65	1	40	1	4	18	1	I	34	82083482	-7
9)EASY SHARE W/ TEACHER	65	5	21	0	18	21	0	A	60	-36	3846
10)EASY CHOOSE W/ LEARN	65	4	18	1	18	22	1	A	63	48205049	-24
11)EASY CHOOSE TIME TO LEA	65	1	29	1	20	13	1	I	52	38099238	-33
12)EASY CHOOSE HOWMUCH LE	65	0	39	6	4	18	0	I	33	68903508	-6
13)NEED FORMS OF Co	65	3	25	1	18	21	0	I	60	65375	-52
14)CERTIFICATE AT END	65	1	38	6	5	14	1	I	32	75892369	-10
15)SLIDES WITH AUDIO	65	2	20	1	26	14	2	O	64	61412963	-45
16)MULTIPLE PLATFORMS	65	2	20	1	26	14	2	O	64	61412963	-45

Table (2): Questionnaire Results

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