

# Building a hierarchy of user's needs for learner-centered education applications

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## Summary

Education technology applications have grown quickly in recent years, while there is a lack of publication about applying education theory models in user-centered applications. The study aims to fill this gap, linking Maslow's theory to build a hierarchy of user's needs for learner-centered education applications and proposals related to managing relationship circles and calculating knowledge score for each user.

## Key words:

*User needs, User-centered applications, relationship circles, knowledge score.*

## 1. Introduction

In 1971, Abraham H. Maslow was one of the foremost spokespersons of humanistic psychology, argued that a humanistic educational approach would develop people who are "stronger, healthier, and would take their own lives into their hands to a greater extent. With increased personal responsibility for one's personal life, and with a rational set of values to guide one's choosing, people would begin to actively change the society in which they lived" [1].

Being aware of the significant role of such education, many organizations and individuals have been investing heavily in education. In the e-society, technology is concerned as leverage for education with EdTech (Education Technology) keywords. We get at a glance some EdTech B2C with a lot of users as Massive Open Online Courses MOOCs (Coursera, Edx, iversity, Futurlearn), question-answer system (Quora, Over Exchange) and Knowledge as a Service KaaS system (Gotitapp).

Following the Class central MOOC report [2], by the end of 2019, over 900 universities around the world had announced or launched 13.5K MOOCs, with 110 million student users. MOOCs seem to become the preferred campus of online students.

Quora is a place where you can ask questions you care about and get answers that are amazing [3]. The heart of Quora is the questions — questions that affect the world, questions that explain recent world events, questions that guide important life decisions, and questions that provide insights into why other people think differently. In fact, with 300 million monthly users over the world [4], the system is giving diverse topics with an interesting way to get free qualified answers.

Gotitapp [5] is well-known as photo study, a student or a user takes a photo of their issue then submits it with descriptions such as needs help getting started or being completely lost, or wants extra detailed steps, or wants to check the steps. An online tutor will help the user taking answers, instruction, or explain from text chatting. With this system, the pupils, students can receive support from tutors anytime, anywhere.

The above application names are some of existing education applications. According to the report of Navistar Venters [6], Global EdTech landscape 3.0 maps 26 clusters of 15000 companies into eight steps (create, manage, discover, connect, experience, learn, credential, advance) of the next generation learning lifecycle. MOOCs platforms are nodes of the "Open Online" cluster on the "Learn" step. The EdTech ecosystem is huge and the EdTech industry is growing up so fast. Even before COVID-19, there was already high growth and adoption in education technology, with global EdTech investments reaching US\$18.66 billion in 2019, and the global market for digital services in education is predicted to be worth \$350 billion by 2025 [7].

In crisis as COVID-19, school closures with isolation push global learners on online education applications. To ensure that the human development is not affected, we should not separate any union e-learning application with basic pedagogy and education theories such as Maslow's Theory of Human Motivation [8], Gardner's Theory of Multiple Intelligences [9], and the concept of the "Triune Brain" – Paul Maclean [10,11]. This paper focus on how can adapt Maslow's theory to building a hierarchy of user's needs for the learner-centered online education system.

Maslow's Hierarchy of Needs theory [8], also known as the theory of Human Motivation, was written by American Psychologist, Abraham Maslow in 1943, in the middle of World War II, and yet still seemed up to date and prescient in its content. It remains one of the most significant fundamental theories in understanding human needs and personal development, directed towards satisfying human needs in the five-stage pyramidal model. The theory is applied in many fields of resource management, personal development, and cognitive studies. Many educational establishments using it as a lodestar in schools. From the Knowledge of Maslow's hierarchy of Needs, we link the theory to research on the needs of users in a framework for adaptive EdTech system, reflect a real, attractive, satisfying, productive education environment on the Internet.

The remainder of this paper is structured as follows: First, we propose a hierarchy of the user's needs for learner-centered education applications based on Maslow's hierarchy of Needs. From each layer, we define how to refer it to the needs of user in a learner-centered online education system. In section 3, we show a solution to improve user satisfaction on the "love and belonging" layer by an activity booking network. Simulating the knowledge score to enhance user satisfaction on the esteem layer will be presented in section 4. In this paper, an adaptive EdTech application is mentioned as any learner-centered online education application.

## 2. Adapting Maslow's hierarchy of needs for an adaptive EdTech system

We show the main idea of this study in Figure 1. Five layers of user's needs with an adaptive EdTech system is based on the five-stage Maslow's Hierarchy of needs theory.

The first layer, Physiological of Maslow's hierarchy, is all about requirements for human survival, e.g., water, food, and shelter. Applying that to an adaptive EdTech system, what are the physiological needs of the user in the digital life. One user called is living on an online system when the user logs in the system. They need to look, to feel how to get an easy way to use service and convenient to reach the topic they are searching with the acceptable response time. That are the needs of UX/UI design and high service availability.

About the network infrastructure of the user side, the existing EdTech systems as MOOCs (Coursera, Edx, iversity, Futurlearn), Quora, Over Exchange, Gotitapp, etc. do not care. In the case, knowledge providers do not support the Internet connection condition of the client-side: such as a big shopping center do not support public transports for a client coming to shop. Usually, this service is left for the third provider side, so it is absent in this hierarchy.

The second layer, Safety needs: According to Maslow (1943,1954) [8,12], "If the physiological needs are relatively well gratified, there then emerges a new set of needs, which we may categorize roughly as the safety needs.". When a user is online, the user does not stop being human. Hence, the safety needs in digital life appear immediately when the user side has available connect and access online services. The requirements related to user data privacy and security, system stability, guarantee the content.

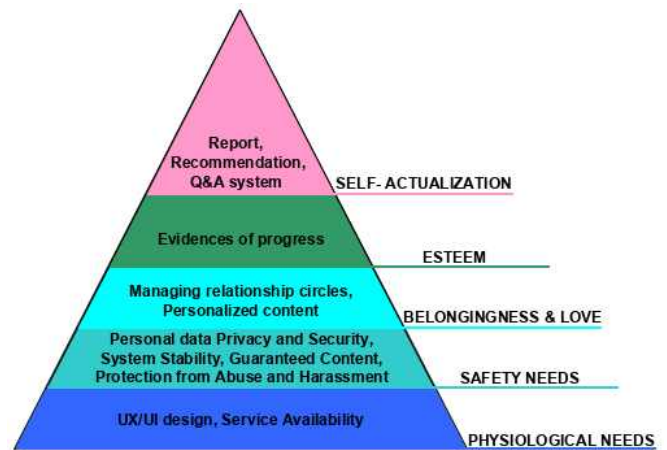


Fig. 1 Hierarchy of user's needs for a learner-centered education application.

Adaptive online education applications need to support users out of the fears in the Internet environment, e.g., disclosing personal information, impersonation, trading personal data with the third side without consent of the user, worries of wrong or harmful content, and fear of online abuse and harassment, and so on. Besides, security for the authentication manager and payment system are also matters of user's concern.

To meet current privacy laws and still collect and analyze user data, some of EdTech, e.g., Quora, Cognitive Class (IBM), they are using the privacy solution of TrustArc Inc with detail option tables. There are several types of information related to user data: Term of Use/ Services, Privacy policy, and Cookie policy. In deep with the classification of a cookie or privacy policy, there are three level basic settings: Required cookies, Function cookies, and Personal collection. Some applications provide advanced settings: the user can see in detail each cookie or site that will collect information to make a conscious decision to allow or not. It is a big challenge, especially for those users not proficient technology or impatient.

About the guaranteed content, the prestigious learning courses cooperated with other prestigious universities, companies, organizations, or well-known people.

The third layer, Belongingness and Love needs – Maslow appreciated the role of the communities, "We still underplay the deep importance of the neighborhood, of one's territory, of one's clan, of one's own "kind," one's Class, one's gang, one's familiar working colleagues" [12]. With the advent of the Internet, the community concept was expanded with the idea of online communities. In the book "The Enterprise guide to online communities" [13], Tyler Doulas called four types of online communities, which give customers and companies a new way to interact, re-establishing a meaningful sense of connection: Social community, Support community, Advocate community, and Insight community. Users of online application cannot ignore the online communities. However, how can the system help users manage the relationships arising from there? In the next section. We will describe more the proposal about a new method for creating and joining active relationship circles.

Besides relationships among users, the relationship between each user and system is the most concerning issue on the layer because it is the minimum relationship each user's need. Now a day, smart applications make computer can become a friend of human, such as Sherry Turkle described: "From the early days. We saw that computers offer the illusion of companionship without the demands of friendship and then, as the programs got really good, the illusion of friendship without the demands of intimacy" [14]. Indeed, the rapid development of AI technology helps all users feel welcomed and understood, breaks all barriers of geography distance, time, cultures, characters, and old boxes of prejudice. Content is personalized for each user. Immersive learning with VR, AR, 3D, or game-based learning help increase the effectiveness of learning.

The fourth layer, Esteem needs - in some social network, some users want to show the lover, the number of followers, the number of likes for a post. However, in an EdTech system, we put the feelings in the third layer, just such as a comfortable environment or space for users to keep motivations to reach the targets in Esteem layer that are higher feelings. That proves that the user is more senior than himself in the past or other users. They may be in the form of certificates, grade, number of up-vote, or knowledge score that we will describe more in section 4. Besides, the technology Remote proctoring for fair remote assessments should be on the layer.

The fifth layer, the needs for Self-actualization – According to the theory of motivation (Maslow, 1943, 1954), human needs form an "integrated hierarchy," in which basic needs such as safety, belonging, connection, and self-esteem must be satisfied to a certain degree for one to move toward becoming all that one is capable of becoming: self-actualization.

Via theories of Maslow [8,12,15] and some contemporary theory and related researches [16,17,18], we meet some notions that can reflex to digital life for user, such as Big-five, self-determined, deficiency versus growth motivation. Thus, we propose three functions on the layer to help increase the percent user is satisfied the self-actualization needs: automatically and on-demand Report function; Deficiency and growth motivation recommendation and Question and Answer system. In the next papers, we will describe more detail about the wonderful layer.

We call an EdTech system, which can meet all needs of each user on all five layers, as the above describes is an adaptive EdTech system or learner-centered online education system.

### 3. Improving user satisfaction on the third layer by an activity booking network

Besides support communities to help user finding answers for a specific question, there are some other systems encourage user to create and join hobby activities communities, LeanIn [19] is a typical example. The circles in LeanIn connect members in small groups to meet up online or offline. If one new member wants to join a group, the user needs to send a request to the administrator of the group and wait for the approval. The circles like organization or associations more than individual relationship circles of each one in life.

About activities in the communities, there are some tools to help users to create, send invitation then confirm the time for the meeting up, e.g., Doodle [20]. The approaching aspect of Doodle application is suitable for a business environment. Every invitation is pushed to user as tasks. The invitation is sent to a specific address of each staff. By anyway, the system needs to find a suitable time for the necessary meeting. It is not easy to give reject or ignore the type of invitation.

The tools like LeanIn or Doodle support user set time for activities. In fact that the activities in our life are often repeated, e.g., lunchtime, coffee time, giving time, etc. Besides, time and Knowledge, which are shared in the activities, are valuable as resources. Hence, we propose a new approach towards an activity booking network with flexible schedules, specific personal relationship circles, and tie quotas.

With Figure 2, we show a flowchart about a process to open an activity in the system. Y and X are two users of the system. X is in relationship Circle Cx of user Y. X does not know what Cx is. On the personal site, user Y creates an activity A1 with values of attributes: scheduler, description about A1, Location and contact, type of the activity



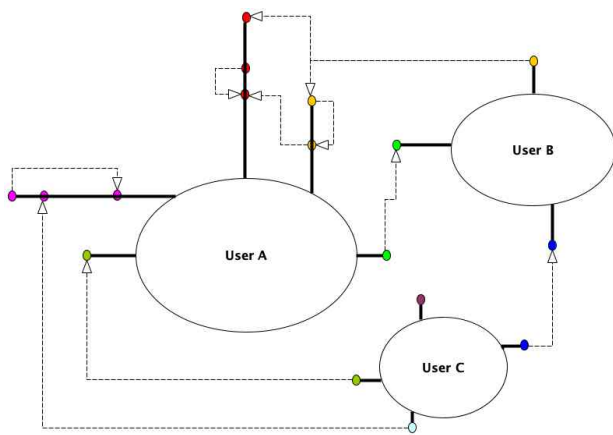


Fig. 3 Simulate Knowledge Score for 3 users.

In here, there is a concern about the number of colors to simulate the topic. With the simulation way, we need to have the number of colors equal to the number of topics we are simulating. For an example, from an answer on Quora, the number topic of Quora in July 2014 is about 400 thousand topics, average four topics are created every minute, then until July 2018, there are over 8,8 million topics. The number of topics keeps increasing at a slower speed when they cover most issues. However, we can reduce the number of topics with the MECE principle [23], decide the type of classification or group for topics.

To calculate the score, we consider each AR as a node, so we have a directed graph, and we can calculate the knowledge score based on the page rank algorithm.

## 5. Conclusions

In this paper, we linked Maslow's theory to build a hierarchy of user's needs for learner-centered online Education applications or adaptive EdTech applications with some detailed proposals for the third and the fourth layer. On the third layer, we proposed a new approach towards an activity booking network with flexible schedules, specific personal relationship circles, and tie quotas. On the fourth layer, we use colors and pipes to simulate knowledge scores for all users to record all values everyone's Knowledge of the world. With all the described features of the framework, this study towards bringing users to a balanced environment for adaptive online learning and development, connecting activities in a safe digital world for the young user and using

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technology to overcome the disadvantages of real life. In the next papers, we will mention more about aspects using AI to support protecting, counseling for the young user, and increasing percent user is satisfied with the self-actualization needs.

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