Development of a Reading Material Recommender System Based On Design Science Research Approach

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Who are we?

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Overview

- Motivation and problem identification
- Objective of our software
- Design and development
- Demonstration
- Evaluation
- Conclusion
- Comments & questions

Motivation

- Students majoring in information systems (IS), should not only be technically competent, but also prepared to collaborate effectively in face-to-face and virtual team settings.
- Effective collaboration is an important interpersonal skills for an entry-level software developer’ professional growth within an organization.

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Problem Identification

- Students from an online course skipped reading 39 percent of all messages in an online discussion to save time Qui and McDougall (2015).
- Peters and Hewitt (2010) showed that 27 percent of students from a large online class avoided reading messages written by some peers altogether, while another 46 percent actively sought messages written by specific peers.

Qiu, M., & McDougall, D. (2015). Influence of group configuration on online discourse reading. *Computers & Education*, *87*, 151-165.

Peters, V. L., & Hewitt, J. (2010). An investigation of student practices in asynchronous computer conferencing courses. *Computers & Education*, *54*(4), 951-961.

Problem Identification

There are four potential contributors to the conversational overload problem:

- Limited student readiness
- Quantity of information
- Quality of information
- Medium interface

Eryilmaz et al., 2019 CSUS-4

Objective of Our Software

Reduce students' counterproductive conversational overload coping strategies in large annotation based literature discussions.

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Design

- Collaborative Filtering
- Content-based Filtering
- Knowledge-based filtering
- Hybrid approaches

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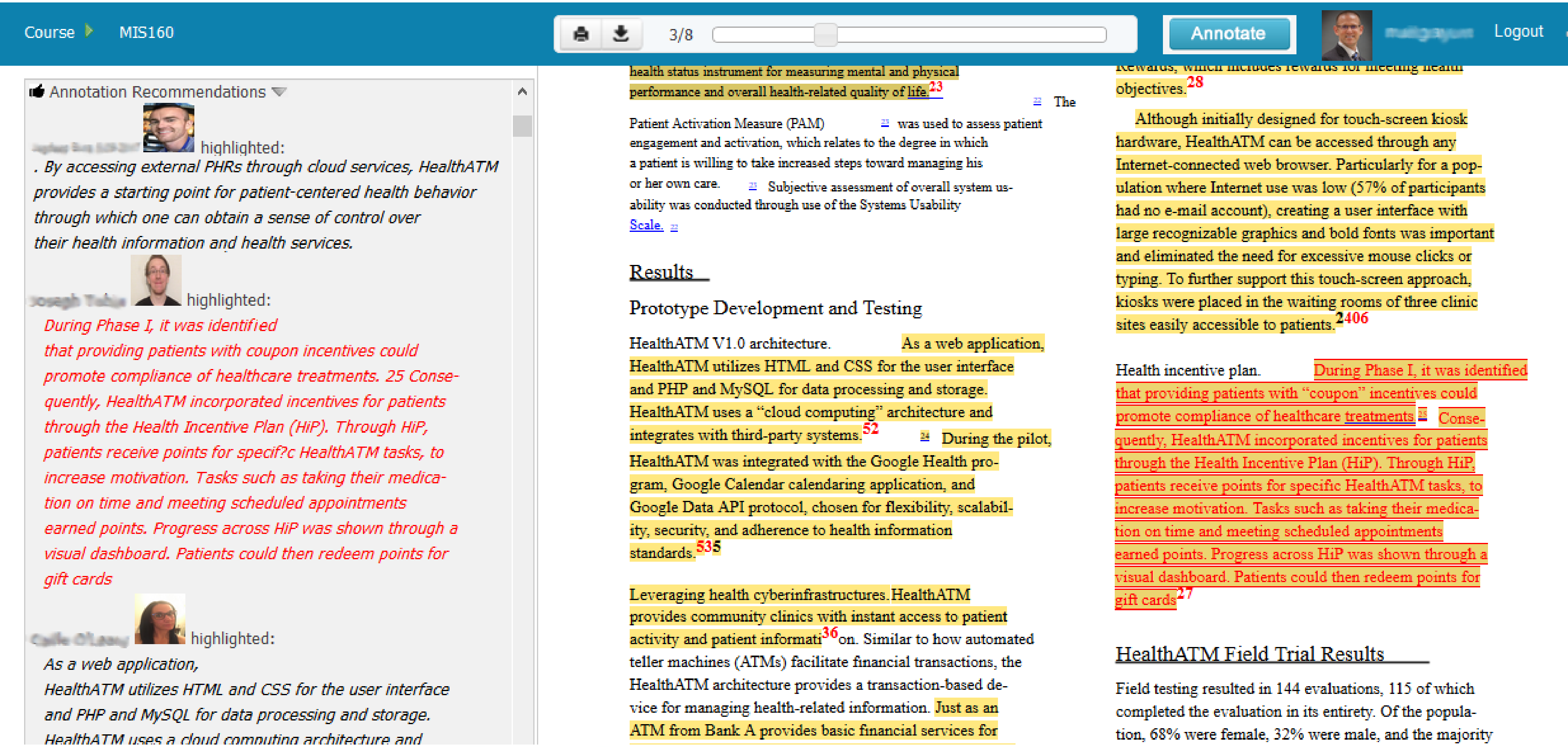
Collaborative Filtering Similarity Metrics

- Pearson correlation coefficient (PCC)
- Cosine Similarity
- Constrained PCC

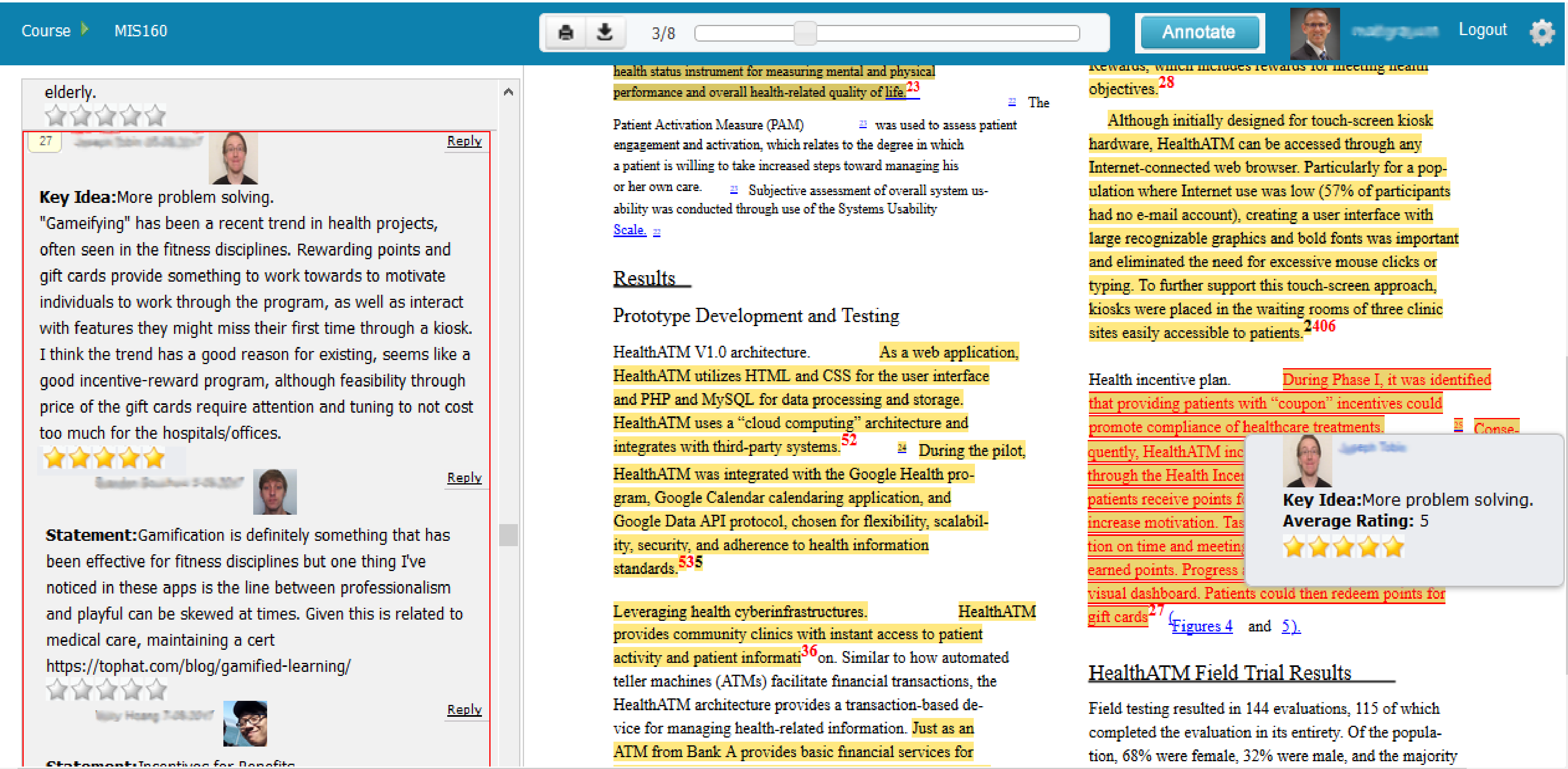
CSCL Environment



Eryilmaz, E., Thoms, B., & Canelon, J. (2018). How Design Science Research Helps Improve Learning Efficiency in Online Conversations. *Communications of the Association for Information Systems*, *42*(1), 21.

Eryilmaz et al., 2019 CSUS-8

CSCL Environment



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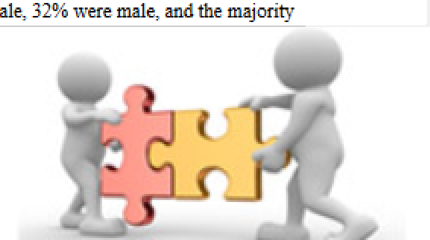
Eryilmaz et al., 2019 CSUS-9



Demonstration

Experiment 1: Is there any difference in the predictive accuracy and perceived usefulness of the developed recommendation functionalities?

Experiment 2: Does the recommender system with the highest predictive accuracy and perceived usefulness decrease students' conversational overload coping strategies in online collaborative literature processing?

Evaluation-Predictive Accuracy

Recommender System	Root Mean Squared Error
Cosine Similarity	1.73
Pearson Correlation Coefficient	1.21
Constrained Pearson Correlation Coefficient	0.87

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Evaluation-Perceived Usefulness

Q1: The recommendations were exactly what I was looking for

Recommender System	Average	Standard Deviation
Cosine Similarity	3.62	0.36
Pearson Correlation Coefficient	4.06	0.60
Constrained Pearson Correlation Coefficient	4.44	0.38

$F(2,99) = 12.90$, $p < 0.001$***

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Evaluation-Perceived Usefulness

Q1: The recommendations were exactly what I was looking for

Comparison pair	Tukey HSD Q statistic	Tukey HSD p-value
Cosine Similarity vs Pearson Correlation Coefficient	3.85	0.02*
Cosine Similarity vs Constrained Pearson Correlation Coefficient	3.33	0.05*
Pearson Correlation Coefficient vs Constrained Pearson Correlation Coefficient	7.18	0.001**

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Evaluation-Perceived Usefulness

Q2: I was surprised by the recommendations

Recommendation Functionality	Average	Standard Deviation
Cosine Similarity	4.09	0.45
Pearson Correlation Coefficient	4.24	0.43
Constrained Pearson Correlation Coefficient	4.35	0.42

$F(2,99) = 1.39$, $p = 0.25$

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Evaluation-Perceived Usefulness

Q3: The recommendations helped me to read instructional materials more effectively

Recommendation Functionality	Average	Standard Deviation
Cosine Similarity	4.15	0.49
Pearson Correlation Coefficient	4.29	0.46
Constrained Pearson Correlation Coefficient	4.38	0.31

$F(2,99) = 1.15, p = 0.32$

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Evaluation-Perceived Usefulness

Q4: The recommendations prompted me to read postings on the forum

Recommendation Functionality	Average	Standard Deviation
Cosine Similarity	3.73	0.69
Pearson Correlation Coefficient	4.18	0.51
Constrained Pearson Correlation Coefficient	4.59	0.37

$F(2,99) = 11.82$, $p < 0.001$***

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Evaluation-Perceived Usefulness

Q4: The recommendations prompted me to read postings on the forum

Comparison pair	Tukey HSD Q statistic	Tukey HSD p-value
Cosine Similarity vs Pearson Correlation Coefficient	3.56	0.04*
Cosine Similarity vs Constrained Pearson Correlation Coefficient	6.88	0.001**
Pearson Correlation Coefficient vs Constrained Pearson Correlation Coefficient	3.32	0.05*

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Evaluation-Perceived Usefulness

Q5: The recommendations prompted me to write on the forum

Recommendation Functionality	Average	Standard Deviation
Cosine Similarity	3.89	0.59
Pearson Correlation Coefficient	4.09	0.26
Constrained Pearson Correlation Coefficient	4.26	0.20

$F(2,99) = 3.53$, $p = 0.03$*

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Evaluation-Perceived Usefulness

Q5: The recommendations prompted me to write on the forum

Comparison pair	**Tukey HSD Q statistic**	**Tukey HSD p-value**
Cosine Similarity vs Pearson Correlation Coefficient	2.02	0.33
Cosine Similarity vs Constrained Pearson Correlation Coefficient	3.76	0.02*
Pearson Correlation Coefficient vs Constrained Pearson Correlation Coefficient	1.73	0.44

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Evaluation-Conversation Overload Coping Strategies

Q1: In an average week, what percentage of the week's messages do you read?

	Control Software	Constrained Pearson Correlation Coefficient		
Choices	%	%	Z	P
0-20%	0.24	0.03	2.51	0.01**
21-40%	0.15	0.12	0.36	0.72
41-60%	0.24	0.18	0.60	0.55
61-80%	0.24	0.50	-2.26	0.02*
81-100%	0.15	0.18	-0.33	0.74

Eryilmaz et al., 2019 CSUS-19

Evaluation-Conversation Overload Coping Strategies

Q2: Of the notes you open, approximately, what percentage of notes do you skim quickly or not read the end?

	Control Software	**Constrained Pearson Correlation Coefficient**		
Choices	%	%	Z	P
0-20%	0.03	0.32	-3.18	0.001***
21-40%	0.19	0.18	0.31	0.76
41-60%	0.41	0.18	2.13	0.03*
61-80%	0.06	0.23	-2.05	0.04*
81-100%	0.31	0.09	4.66	0.03*

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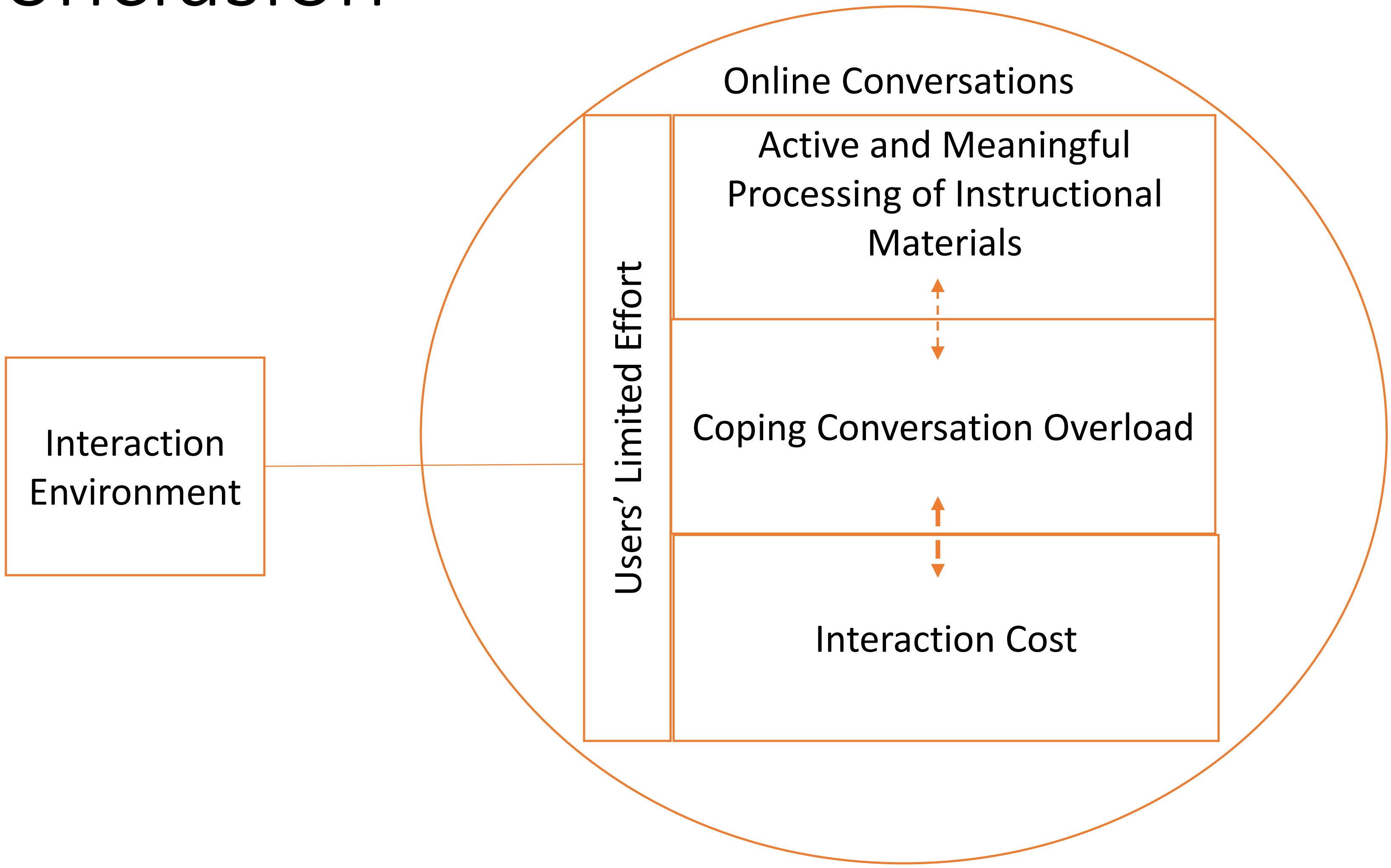
Conclusion



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Thank You for Your Time

Your Comments and Questions are welcomed.

Please address feedback to:

evren.eryilmaz@csus.edu