

A BIM Interoperable Web-Based DSS for Vegetated Roofing System Selection

Kongkun Charoenvisal

Dissertation proposal submitted to the faculty of the Virginia Polytechnic Institute and State University in partial fulfillment of the requirements for the degree of

Doctor of Philosophy
in
Architecture and Design Research

James R. Jones, Chair

Kihong R. Ku

Tanyel T. Bulbul

Elizabeth J. Grant

Scott A. Ragon

September 24th, 2013

Blacksburg, Virginia

Keywords: Building Information Modeling (BIM), Decision Support Systems (DSS), Vegetated Roofing Systems, Industrial Foundation Classes (IFC), Integrated Practice (IP), Sustainable Architecture

Copyright 2013, Kongkun Charoenvisal

Copyrighted Materials

Figure/Table	Title	Copyright Status	Note
Figure 1-1	Value added, cost of changes, and current compensation distribution for design service	Fair use	Fair use analysis result attached
Figure 1-2	BIM utilization throughout building lifecycle based on the International Alliance of Interoperability (IAI) Nordic chapter 2000 BIM product Model	Fair use	Fair use analysis result attached
Figure 1-4	Decision making system	Fair use	Fair use analysis result attached
Figure 1-5	Components of the decision support system	Fair use	Fair use analysis result attached
Figure 1-6	High-level architecture of DSS	Fair use	Fair use analysis result attached
Figure 1-7	Multitier architecture for incorporating optimization, simulation, and other models into Web-based DSS	Fair use	Fair use analysis result attached
Figure 1-8	Key Characteristics and Capabilities of DSS	Fair use	Fair use analysis result attached
Figure 1-11	Prototyping paradigm	Fair use	Fair use analysis result attached
Figure 2-1	Simplified framework of agents	Fair use	Fair use analysis result attached
Figure 2-2	Knowledge management in C-Sand	Fair use	Fair use analysis result attached
Figure 2-5	Three technology levels and the roles of people who involve in the development of DSS	Fair use	Fair use analysis result attached
Figure 2-6	DSS development approach selection process	Fair use	Fair use analysis result attached
Figure 2-7	Evolutionary process model	Fair use	Fair use analysis result attached
Figure 2-8	Prototyping process model	Fair use	Fair use analysis result attached
Figure 2-9	Prototyping development process	Fair use	Fair use analysis result attached
Figure 2-10	Throwaway prototyping development process	Fair use	Fair use analysis result attached
Figure 2-11	Data management subsystem structure and components	Fair use	Fair use analysis result attached
Figure 2-12	Model management subsystem structure and components	Fair use	Fair use analysis result attached
Figure 2-13	Dialog generation and management subsystem structure and components	Fair use	Fair use analysis result attached
Figure 2-14	Schematic view of DSS	Fair use	Fair use analysis result attached
Figure 2-15	Web-based DSS architecture	Fair use	Fair use analysis result attached
Figure 2-16	Typical green roof assembly	Fair use	Fair use analysis result attached
Figure 2-17	Influence diagram of the decision-making for vegetated roofing selection	Fair use	Fair use analysis result attached
Figure 2-20	Schematic structure of an Expert System (ES)	Fair use	Fair use analysis result attached
Figure 2-21	Process for ES development	Fair use	Fair use analysis result attached
Figure 3-2	Value analysis	Fair use	Fair use analysis result attached
Figure 3-4	Quality requirements	Fair use	Fair use analysis result attached
Figure 3-5	Design pyramid for WebApps	Fair use	Fair use analysis result attached
Figure 3-6	Testing process for WebApps	Fair use	Fair use analysis result attached
Table 2-18	Generic green roof categories and types	Fair use	Fair use analysis result attached

Draft 09/01/2009

(Questions? Concerns? Contact Gail McMillan, Director of the Digital Library and Archives at Virginia Tech's University Libraries: gailmac@vt.edu)

(Please ensure that Javascript is enabled on your browser before using this tool.)

Virginia Tech ETD Fair Use Analysis Results

This is not a replacement for professional legal advice but an effort to assist you in making a sound decision.

Name: Kongkun Charoenvisal

Description of item under review for fair use: Figure 1-1: Value added, cost of changes, and current compensation distribution for design service. Source: Pressman, Andrew. Integrated practice in perspective: A new model for the architectural profession. Architecture Record 2007.

Report generated on: 09-11-2013 at : 22:00:25

Based on the information you provided:

Factor 1

Your consideration of the purpose and character of your use of the copyright work weighs: *in favor of fair use*

Factor 2

Your consideration of the nature of the copyrighted work you used weighs: *in favor of fair use*

Factor 3

Your consideration of the amount and substantiality of your use of the copyrighted work weighs: *in favor of fair use*

Factor 4

Your consideration of the effect or potential effect on the market after your use of the copyrighted work weighs: *in favor of fair use*

Based on the information you provided, your use of the copyrighted work weighs: *in favor of fair use*



Draft 09/01/2009

(Questions? Concerns? Contact Gail McMillan, Director of the Digital Library and Archives at Virginia Tech's University Libraries: gailmac@vt.edu)

(Please ensure that Javascript is enabled on your browser before using this tool.)

Virginia Tech ETD Fair Use Analysis Results

This is not a replacement for professional legal advice but an effort to assist you in making a sound decision.

Name: Kongkun Charoenvisal

Description of item under review for fair use: Figure 1-2: BIM utilization throughout building lifecycle based on the International Alliance of Interoperability (IAI) Nordic chapter 2000 BIM product Model. Source: NIBS. 2007. "Section 2 – Prologue to the National BIM Standard." In United States National Building Information Modeling Standard, 20. Washington, DC: National Institute of Building Sciences.

Report generated on: 09-11-2013 at : 22:02:44

Based on the information you provided:

Factor 1

Your consideration of the purpose and character of your use of the copyright work weighs: *in favor of fair use*

Factor 2

Your consideration of the nature of the copyrighted work you used weighs: *in favor of fair use*

Factor 3

Your consideration of the amount and substantiality of your use of the copyrighted work weighs: *in favor of fair use*

Factor 4

Your consideration of the effect or potential effect on the market after your use of the copyrighted work weighs: *in favor of fair use*

Based on the information you provided, your use of the copyrighted work weighs: *in favor of fair use*



Draft 09/01/2009

(Questions? Concerns? Contact Gail McMillan, Director of the Digital Library and Archives at Virginia Tech's University Libraries: gailmac@vt.edu)

(Please ensure that Javascript is enabled on your browser before using this tool.)

Virginia Tech ETD Fair Use Analysis Results

This is not a replacement for professional legal advice but an effort to assist you in making a sound decision.

Name: Kongkun Charoenvisal

Description of item under review for fair use: Figure 1-4: Decision making system. Source: Sprague, Ralph H., and Eric D. Carlson. 1982. Building effective decision support systems. Englewood Cliffs, N.J.: Prentice-Hall

Report generated on: 09-11-2013 at : 22:04:55

Based on the information you provided:

Factor 1

Your consideration of the purpose and character of your use of the copyright work weighs: *in favor of fair use*

Factor 2

Your consideration of the nature of the copyrighted work you used weighs: *in favor of fair use*

Factor 3

Your consideration of the amount and substantiality of your use of the copyrighted work weighs: *in favor of fair use*

Factor 4

Your consideration of the effect or potential effect on the market after your use of the copyrighted work weighs: *in favor of fair use*

Based on the information you provided, your use of the copyrighted work weighs: *in favor of fair use*



Draft 09/01/2009

(Questions? Concerns? Contact Gail McMillan, Director of the Digital Library and Archives at Virginia Tech's University Libraries: gailmac@vt.edu)

(Please ensure that Javascript is enabled on your browser before using this tool.)

Virginia Tech ETD Fair Use Analysis Results

This is not a replacement for professional legal advice but an effort to assist you in making a sound decision.

Name: Kongkun Charoenvisal

Description of item under review for fair use: Figure 1-5: Components of the decision support system. Source: Sprague, Ralph H., and Eric D. Carlson. 1982. Building effective decision support systems. Englewood Cliffs, N.J.: Prentice-Hall.

Report generated on: 09-11-2013 at : 22:14:11

Based on the information you provided:

Factor 1

Your consideration of the purpose and character of your use of the copyright work weighs: *in favor of fair use*

Factor 2

Your consideration of the nature of the copyrighted work you used weighs: *in favor of fair use*

Factor 3

Your consideration of the amount and substantiality of your use of the copyrighted work weighs: *in favor of fair use*

Factor 4

Your consideration of the effect or potential effect on the market after your use of the copyrighted work weighs: *in favor of fair use*

Based on the information you provided, your use of the copyrighted work weighs: *in favor of fair use*



Draft 09/01/2009

(Questions? Concerns? Contact Gail McMillan, Director of the Digital Library and Archives at Virginia Tech's University Libraries: gailmac@vt.edu)

(Please ensure that Javascript is enabled on your browser before using this tool.)

Virginia Tech ETD Fair Use Analysis Results

This is not a replacement for professional legal advice but an effort to assist you in making a sound decision.

Name: Kongkun Charoenvisal

Description of item under review for fair use: Figure 1-6: High-level architecture of DSS. Source: Turban, Efraim, Jay E. Aronson, Ting-Peng Liang, and Ramesh Sharda. 2007. Decision Support and Business Intelligence Systems. 8 ed. Upper Saddle River, NJ: Pearson Prentice Hall.

Report generated on: 09-11-2013 at : 22:11:59

Based on the information you provided:

Factor 1

Your consideration of the purpose and character of your use of the copyright work weighs: *in favor of fair use*

Factor 2

Your consideration of the nature of the copyrighted work you used weighs: *in favor of fair use*

Factor 3

Your consideration of the amount and substantiality of your use of the copyrighted work weighs: *in favor of fair use*

Factor 4

Your consideration of the effect or potential effect on the market after your use of the copyrighted work weighs: *in favor of fair use*

Based on the information you provided, your use of the copyrighted work weighs: *in favor of fair use*



Draft 09/01/2009

(Questions? Concerns? Contact Gail McMillan, Director of the Digital Library and Archives at Virginia Tech's University Libraries: gailmac@vt.edu)

(Please ensure that Javascript is enabled on your browser before using this tool.)

Virginia Tech ETD Fair Use Analysis Results

This is not a replacement for professional legal advice but an effort to assist you in making a sound decision.

Name: Kongkun Charoenvisal

Description of item under review for fair use: Figure 1-7: Multitier architecture for incorporating optimization, simulation, and other models into Web-based DSS. Source: Turban, Efraim, Jay E. Aronson, Ting-Peng Liang, and Ramesh Sharda. 2007. Decision Support and Business Intelligence Systems. 8 ed. Upper Saddle River, NJ: Pearson Prentice Hall.

Report generated on: 09-11-2013 at : 22:17:45

Based on the information you provided:

Factor 1

Your consideration of the purpose and character of your use of the copyright work weighs: *in favor of fair use*

Factor 2

Your consideration of the nature of the copyrighted work you used weighs: *in favor of fair use*

Factor 3

Your consideration of the amount and substantiality of your use of the copyrighted work weighs: *in favor of fair use*

Factor 4

Your consideration of the effect or potential effect on the market after your use of the copyrighted work weighs: *in favor of fair use*

Based on the information you provided, your use of the copyrighted work weighs: *in favor of fair use*



Draft 09/01/2009

(Questions? Concerns? Contact Gail McMillan, Director of the Digital Library and Archives at Virginia Tech's University Libraries: gailmac@vt.edu)

(Please ensure that Javascript is enabled on your browser before using this tool.)

Virginia Tech ETD Fair Use Analysis Results

This is not a replacement for professional legal advice but an effort to assist you in making a sound decision.

Name: Kongkun Charoenvisal

Description of item under review for fair use: Figure 1-8: Key Characteristics and Capabilities of DSS. Source: Turban, Efraim, Jay E. Aronson, Ting-Peng Liang, and Ramesh Sharda. 2007. Decision Support and Business Intelligence Systems. 8 ed. Upper Saddle River, NJ: Pearson Prentice Hall.

Report generated on: 09-11-2013 at : 22:22:12

Based on the information you provided:

Factor 1

Your consideration of the purpose and character of your use of the copyright work weighs: *in favor of fair use*

Factor 2

Your consideration of the nature of the copyrighted work you used weighs: *in favor of fair use*

Factor 3

Your consideration of the amount and substantiality of your use of the copyrighted work weighs: *in favor of fair use*

Factor 4

Your consideration of the effect or potential effect on the market after your use of the copyrighted work weighs: *in favor of fair use*

Based on the information you provided, your use of the copyrighted work weighs: *in favor of fair use*



Draft 09/01/2009

(Questions? Concerns? Contact Gail McMillan, Director of the Digital Library and Archives at Virginia Tech's University Libraries: gailmac@vt.edu)

(Please ensure that Javascript is enabled on your browser before using this tool.)

Virginia Tech ETD Fair Use Analysis Results

This is not a replacement for professional legal advice but an effort to assist you in making a sound decision.

Name: Kongkun Charoenvisal

Description of item under review for fair use: Figure 1-11: Prototyping paradigm. Source: Pressman, Roger S. 2010. Software Engineering : A Practitioner's Approach. 7th ed. New York: McGraw-Hill Higher Education.

Report generated on: 09-11-2013 at : 22:49:24

Based on the information you provided:

Factor 1

Your consideration of the purpose and character of your use of the copyright work weighs: *in favor of fair use*

Factor 2

Your consideration of the nature of the copyrighted work you used weighs: *in favor of fair use*

Factor 3

Your consideration of the amount and substantiality of your use of the copyrighted work weighs: *in favor of fair use*

Factor 4

Your consideration of the effect or potential effect on the market after your use of the copyrighted work weighs: *in favor of fair use*

Based on the information you provided, your use of the copyrighted work weighs: *in favor of fair use*



Draft 09/01/2009

(Questions? Concerns? Contact Gail McMillan, Director of the Digital Library and Archives at Virginia Tech's University Libraries: gailmac@vt.edu)

(Please ensure that Javascript is enabled on your browser before using this tool.)

Virginia Tech ETD Fair Use Analysis Results

This is not a replacement for professional legal advice but an effort to assist you in making a sound decision.

Name: Kongkun Charoenvisal

Description of item under review for fair use: Figure 2-1: Simplified framework of agents. Source: Malkawi, Ali M. 2004b. "Virtual Agents as a Decisiosn Support for Thermal Simulation." Journal of Architectural and Planning Research no. 21:4 (Winter 2004):363.

Report generated on: 09-11-2013 at : 22:27:04

Based on the information you provided:

Factor 1

Your consideration of the purpose and character of your use of the copyright work weighs: *in favor of fair use*

Factor 2

Your consideration of the nature of the copyrighted work you used weighs: *in favor of fair use*

Factor 3

Your consideration of the amount and substantiality of your use of the copyrighted work weighs: *in favor of fair use*

Factor 4

Your consideration of the effect or potential effect on the market after your use of the copyrighted work weighs: *in favor of fair use*

Based on the information you provided, your use of the copyrighted work weighs: *in favor of fair use*



Draft 09/01/2009

(Questions? Concerns? Contact Gail McMillan, Director of the Digital Library and Archives at Virginia Tech's University Libraries: gailmac@vt.edu)

(Please ensure that Javascript is enabled on your browser before using this tool.)

Virginia Tech ETD Fair Use Analysis Results

This is not a replacement for professional legal advice but an effort to assist you in making a sound decision.

Name: Kongkun Charoenvisal

Description of item under review for fair use: Figure 2-2: Knowledge management in C-Sand. Source: Boddy, S., Y. Rezgui, M. Wetherill, and G. Cooper. 2006. "Knowledge Informed Decision Making in the Building Lifecycle: An application to the design of a Water Drainage System." Automation in Construction no. 16 (2007):596-606.

Report generated on: 09-11-2013 at : 22:32:50

Based on the information you provided:

Factor 1

Your consideration of the purpose and character of your use of the copyright work weighs: *in favor of fair use*

Factor 2

Your consideration of the nature of the copyrighted work you used weighs: *in favor of fair use*

Factor 3

Your consideration of the amount and substantiality of your use of the copyrighted work weighs: *in favor of fair use*

Factor 4

Your consideration of the effect or potential effect on the market after your use of the copyrighted work weighs: *in favor of fair use*

Based on the information you provided, your use of the copyrighted work weighs: *in favor of fair use*



Draft 09/01/2009

(Questions? Concerns? Contact Gail McMillan, Director of the Digital Library and Archives at Virginia Tech's University Libraries: gailmac@vt.edu)

(Please ensure that Javascript is enabled on your browser before using this tool.)

Virginia Tech ETD Fair Use Analysis Results

This is not a replacement for professional legal advice but an effort to assist you in making a sound decision.

Name: Kongkun Charoenvisal

Description of item under review for fair use: Figure 2-5: Three technology levels and the roles of people who involve in the development of DSS. Source: Sprague, Ralph H., and Eric D. Carlson. 1982. Building effective decision support systems. Englewood Cliffs, N.J.: Prentice-Hall.

Report generated on: 09-11-2013 at : 22:36:56

Based on the information you provided:

Factor 1

Your consideration of the purpose and character of your use of the copyright work weighs: *in favor of fair use*

Factor 2

Your consideration of the nature of the copyrighted work you used weighs: *in favor of fair use*

Factor 3

Your consideration of the amount and substantiality of your use of the copyrighted work weighs: *in favor of fair use*

Factor 4

Your consideration of the effect or potential effect on the market after your use of the copyrighted work weighs: *in favor of fair use*

Based on the information you provided, your use of the copyrighted work weighs: *in favor of fair use*



Draft 09/01/2009

(Questions? Concerns? Contact Gail McMillan, Director of the Digital Library and Archives at Virginia Tech's University Libraries: gailmac@vt.edu)

(Please ensure that Javascript is enabled on your browser before using this tool.)

Virginia Tech ETD Fair Use Analysis Results

This is not a replacement for professional legal advice but an effort to assist you in making a sound decision.

Name: Kongkun Charoenvisal

Description of item under review for fair use: Figure 2-6: DSS development approach selection process. Source: Power, Daniel J. 2000. "Decision Support Systems Hyperbook." In. Cedar Falls, IA: DSSResources.COM. <http://dssresources.com/subscriber/password/dssbookhypertext> (accessed October 2010) Englewood Cliffs, N.J.: Prentice-Hall.

Report generated on: 09-11-2013 at : 22:40:02

Based on the information you provided:

Factor 1

Your consideration of the purpose and character of your use of the copyright work weighs: *in favor of fair use*

Factor 2

Your consideration of the nature of the copyrighted work you used weighs: *in favor of fair use*

Factor 3

Your consideration of the amount and substantiality of your use of the copyrighted work weighs: *in favor of fair use*

Factor 4

Your consideration of the effect or potential effect on the market after your use of the copyrighted work weighs: *in favor of fair use*

Based on the information you provided, your use of the copyrighted work weighs: *in favor of fair use*



Draft 09/01/2009

(Questions? Concerns? Contact Gail McMillan, Director of the Digital Library and Archives at Virginia Tech's University Libraries: gailmac@vt.edu)

(Please ensure that Javascript is enabled on your browser before using this tool.)

Virginia Tech ETD Fair Use Analysis Results

This is not a replacement for professional legal advice but an effort to assist you in making a sound decision.

Name: Kongkun Charoenvisal

Description of item under review for fair use: Figure 2-7: Evolutionary process model. Source: Pressman, Roger S. 2010. Software Engineering : A Practitioner's Approach. 7th ed. New York: McGraw-Hill Higher Education.

Report generated on: 09-11-2013 at : 22:45:56

Based on the information you provided:

Factor 1

Your consideration of the purpose and character of your use of the copyright work weighs: *in favor of fair use*

Factor 2

Your consideration of the nature of the copyrighted work you used weighs: *in favor of fair use*

Factor 3

Your consideration of the amount and substantiality of your use of the copyrighted work weighs: *in favor of fair use*

Factor 4

Your consideration of the effect or potential effect on the market after your use of the copyrighted work weighs: *in favor of fair use*

Based on the information you provided, your use of the copyrighted work weighs: *in favor of fair use*



Draft 09/01/2009

(Questions? Concerns? Contact Gail McMillan, Director of the Digital Library and Archives at Virginia Tech's University Libraries: gailmac@vt.edu)

(Please ensure that Javascript is enabled on your browser before using this tool.)

Virginia Tech ETD Fair Use Analysis Results

This is not a replacement for professional legal advice but an effort to assist you in making a sound decision.

Name: Kongkun Charoenvisal

Description of item under review for fair use: Figure 2-8: Prototyping process model. Source: Pressman, Roger S. 2010. Software Engineering : A Practitioner's Approach. 7th ed. New York: McGraw-Hill Higher Education.

Report generated on: 09-11-2013 at : 22:48:01

Based on the information you provided:

Factor 1

Your consideration of the purpose and character of your use of the copyright work weighs: *in favor of fair use*

Factor 2

Your consideration of the nature of the copyrighted work you used weighs: *in favor of fair use*

Factor 3

Your consideration of the amount and substantiality of your use of the copyrighted work weighs: *in favor of fair use*

Factor 4

Your consideration of the effect or potential effect on the market after your use of the copyrighted work weighs: *in favor of fair use*

Based on the information you provided, your use of the copyrighted work weighs: *in favor of fair use*



Draft 09/01/2009

(Questions? Concerns? Contact Gail McMillan, Director of the Digital Library and Archives at Virginia Tech's University Libraries: gailmac@vt.edu)

(Please ensure that Javascript is enabled on your browser before using this tool.)

Virginia Tech ETD Fair Use Analysis Results

This is not a replacement for professional legal advice but an effort to assist you in making a sound decision.

Name: Kongkun Charoenvisal

Description of item under review for fair use: Figure 2-9: Prototyping development process. Source: Turban, Efraim, Jay E. Aronson, Ting-Peng Liang, and Ramesh Sharda. 2007. Decision Support and Business Intelligence Systems. 8 ed. Upper Saddle River, NJ: Pearson Prentice Hall.

Report generated on: 09-11-2013 at : 22:52:13

Based on the information you provided:

Factor 1

Your consideration of the purpose and character of your use of the copyright work weighs: *in favor of fair use*

Factor 2

Your consideration of the nature of the copyrighted work you used weighs: *in favor of fair use*

Factor 3

Your consideration of the amount and substantiality of your use of the copyrighted work weighs: *in favor of fair use*

Factor 4

Your consideration of the effect or potential effect on the market after your use of the copyrighted work weighs: *in favor of fair use*

Based on the information you provided, your use of the copyrighted work weighs: *in favor of fair use*



Draft 09/01/2009

(Questions? Concerns? Contact Gail McMillan, Director of the Digital Library and Archives at Virginia Tech's University Libraries: gailmac@vt.edu)

(Please ensure that Javascript is enabled on your browser before using this tool.)

Virginia Tech ETD Fair Use Analysis Results

This is not a replacement for professional legal advice but an effort to assist you in making a sound decision.

Name: Kongkun Charoenvisal

Description of item under review for fair use: Figure 2-10: Throwaway prototyping development process. Source: Turban, Efraim, Jay E. Aronson, Ting-Peng Liang, and Ramesh Sharda. 2007. Decision Support and Business Intelligence Systems. 8 ed. Upper Saddle River, NJ: Pearson Prentice Hall.

Report generated on: 09-11-2013 at : 22:53:22

Based on the information you provided:

Factor 1

Your consideration of the purpose and character of your use of the copyright work weighs: *in favor of fair use*

Factor 2

Your consideration of the nature of the copyrighted work you used weighs: *in favor of fair use*

Factor 3

Your consideration of the amount and substantiality of your use of the copyrighted work weighs: *in favor of fair use*

Factor 4

Your consideration of the effect or potential effect on the market after your use of the copyrighted work weighs: *in favor of fair use*

Based on the information you provided, your use of the copyrighted work weighs: *in favor of fair use*



Draft 09/01/2009

(Questions? Concerns? Contact Gail McMillan, Director of the Digital Library and Archives at Virginia Tech's University Libraries: gailmac@vt.edu)

(Please ensure that Javascript is enabled on your browser before using this tool.)

Virginia Tech ETD Fair Use Analysis Results

This is not a replacement for professional legal advice but an effort to assist you in making a sound decision.

Name: Kongkun Charoenvisal

Description of item under review for fair use: Figure 2-11: Data management subsystem structure and components. Source: Turban, Efraim, Jay E. Aronson, Ting-Peng Liang, and Ramesh Sharda. 2007. Decision Support and Business Intelligence Systems. 8 ed. Upper Saddle River, NJ: Pearson Prentice Hall.

Report generated on: 09-11-2013 at : 22:55:36

Based on the information you provided:

Factor 1

Your consideration of the purpose and character of your use of the copyright work weighs: *in favor of fair use*

Factor 2

Your consideration of the nature of the copyrighted work you used weighs: *in favor of fair use*

Factor 3

Your consideration of the amount and substantiality of your use of the copyrighted work weighs: *in favor of fair use*

Factor 4

Your consideration of the effect or potential effect on the market after your use of the copyrighted work weighs: *in favor of fair use*

Based on the information you provided, your use of the copyrighted work weighs: *in favor of fair use*



Draft 09/01/2009

(Questions? Concerns? Contact Gail McMillan, Director of the Digital Library and Archives at Virginia Tech's University Libraries: gailmac@vt.edu)

(Please ensure that Javascript is enabled on your browser before using this tool.)

Virginia Tech ETD Fair Use Analysis Results

This is not a replacement for professional legal advice but an effort to assist you in making a sound decision.

Name: Kongkun Charoenvisal

Description of item under review for fair use: Figure 2-12: Model management subsystem structure and components. Source: Turban, Efraim, Jay E. Aronson, Ting-Peng Liang, and Ramesh Sharda. 2007. Decision Support and Business Intelligence Systems. 8 ed. Upper Saddle River, NJ: Pearson Prentice Hall.

Report generated on: 09-11-2013 at : 22:56:42

Based on the information you provided:

Factor 1

Your consideration of the purpose and character of your use of the copyright work weighs: *in favor of fair use*

Factor 2

Your consideration of the nature of the copyrighted work you used weighs: *in favor of fair use*

Factor 3

Your consideration of the amount and substantiality of your use of the copyrighted work weighs: *in favor of fair use*

Factor 4

Your consideration of the effect or potential effect on the market after your use of the copyrighted work weighs: *in favor of fair use*

Based on the information you provided, your use of the copyrighted work weighs: *in favor of fair use*



Draft 09/01/2009

(Questions? Concerns? Contact Gail McMillan, Director of the Digital Library and Archives at Virginia Tech's University Libraries: gailmac@vt.edu)

(Please ensure that Javascript is enabled on your browser before using this tool.)

Virginia Tech ETD Fair Use Analysis Results

This is not a replacement for professional legal advice but an effort to assist you in making a sound decision.

Name: Kongkun Charoenvisal

Description of item under review for fair use: Figure 2-13: Dialog generation and management subsystem structure and components. Source: Turban, Efraim, Jay E. Aronson, Ting-Peng Liang, and Ramesh Sharda. 2007. Decision Support and Business Intelligence Systems. 8 ed. Upper Saddle River, NJ: Pearson Prentice Hall.

Report generated on: 09-11-2013 at : 22:59:44

Based on the information you provided:

Factor 1

Your consideration of the purpose and character of your use of the copyright work weighs: *in favor of fair use*

Factor 2

Your consideration of the nature of the copyrighted work you used weighs: *in favor of fair use*

Factor 3

Your consideration of the amount and substantiality of your use of the copyrighted work weighs: *in favor of fair use*

Factor 4

Your consideration of the effect or potential effect on the market after your use of the copyrighted work weighs: *in favor of fair use*

Based on the information you provided, your use of the copyrighted work weighs: *in favor of fair use*



Draft 09/01/2009

(Questions? Concerns? Contact Gail McMillan, Director of the Digital Library and Archives at Virginia Tech's University Libraries: gailmac@vt.edu)

(Please ensure that Javascript is enabled on your browser before using this tool.)

Virginia Tech ETD Fair Use Analysis Results

This is not a replacement for professional legal advice but an effort to assist you in making a sound decision.

Name: Kongkun Charoenvisal

Description of item under review for fair use: Figure 2-14: Schematic view of DSS. Source: Turban, Efraim, Jay E. Aronson, Ting-Peng Liang, and Ramesh Sharda. 2007. Decision Support and Business Intelligence Systems. 8 ed. Upper Saddle River, NJ: Pearson Prentice Hall.

Report generated on: 09-11-2013 at : 23:01:11

Based on the information you provided:

Factor 1

Your consideration of the purpose and character of your use of the copyright work weighs: *in favor of fair use*

Factor 2

Your consideration of the nature of the copyrighted work you used weighs: *in favor of fair use*

Factor 3

Your consideration of the amount and substantiality of your use of the copyrighted work weighs: *in favor of fair use*

Factor 4

Your consideration of the effect or potential effect on the market after your use of the copyrighted work weighs: *in favor of fair use*

Based on the information you provided, your use of the copyrighted work weighs: *in favor of fair use*



Draft 09/01/2009

(Questions? Concerns? Contact Gail McMillan, Director of the Digital Library and Archives at Virginia Tech's University Libraries: gailmac@vt.edu)

(Please ensure that Javascript is enabled on your browser before using this tool.)

Virginia Tech ETD Fair Use Analysis Results

This is not a replacement for professional legal advice but an effort to assist you in making a sound decision.

Name: Kongkun Charoenvisal

Description of item under review for fair use: Figure 2-15: Web-based DSS architecture. Source: Pressman, Roger S. 2010. Software Engineering : A Practitioner's Approach. 7th ed. New York: McGraw-Hill Higher Education.

Report generated on: 09-11-2013 at : 23:04:31

Based on the information you provided:

Factor 1

Your consideration of the purpose and character of your use of the copyright work weighs: *in favor of fair use*

Factor 2

Your consideration of the nature of the copyrighted work you used weighs: *in favor of fair use*

Factor 3

Your consideration of the amount and substantiality of your use of the copyrighted work weighs: *in favor of fair use*

Factor 4

Your consideration of the effect or potential effect on the market after your use of the copyrighted work weighs: *in favor of fair use*

Based on the information you provided, your use of the copyrighted work weighs: *in favor of fair use*



Draft 09/01/2009

(Questions? Concerns? Contact Gail McMillan, Director of the Digital Library and Archives at Virginia Tech's University Libraries: gailmac@vt.edu)

(Please ensure that Javascript is enabled on your browser before using this tool.)

Virginia Tech ETD Fair Use Analysis Results

This is not a replacement for professional legal advice but an effort to assist you in making a sound decision.

Name: Kongkun Charoenvisal

Description of item under review for fair use: Figure 2-16: Typical green roof assembly. Source: Grant, Elizabeth Joyce. 2007. "A decision-making framework for vegetated roofing system selection." In VPI & SU Architecture Ph D 2007. Blacksburg, Va.: University Libraries, Virginia Polytechnic Institute and State University,. <http://scholar.lib.vt.edu/theses/available/etd-11062007-232745>.

Report generated on: 09-11-2013 at : 23:09:37

Based on the information you provided:

Factor 1

Your consideration of the purpose and character of your use of the copyright work weighs: *in favor of fair use*

Factor 2

Your consideration of the nature of the copyrighted work you used weighs: *in favor of fair use*

Factor 3

Your consideration of the amount and substantiality of your use of the copyrighted work weighs: *in favor of fair use*

Factor 4

Your consideration of the effect or potential effect on the market after your use of the copyrighted work weighs: *in favor of fair use*

Based on the information you provided, your use of the copyrighted work weighs: *in favor of fair use*



Draft 09/01/2009

(Questions? Concerns? Contact Gail McMillan, Director of the Digital Library and Archives at Virginia Tech's University Libraries: gailmac@vt.edu)

(Please ensure that Javascript is enabled on your browser before using this tool.)

Virginia Tech ETD Fair Use Analysis Results

This is not a replacement for professional legal advice but an effort to assist you in making a sound decision.

Name: Kongkun Charoenvisal

Description of item under review for fair use: Figure 2-17: Influence diagram of the decision-making for vegetated roofing selection. Source: Grant, Elizabeth Joyce. 2007. "A decision-making framework for vegetated roofing system selection." In VPI & SU Architecture Ph D 2007. Blacksburg, Va.: University Libraries, Virginia Polytechnic Institute and State University,. <http://scholar.lib.vt.edu/theses/available/etd-11062007-232745>.

Report generated on: 09-11-2013 at : 23:13:51

Based on the information you provided:

Factor 1

Your consideration of the purpose and character of your use of the copyright work weighs: *in favor of fair use*

Factor 2

Your consideration of the nature of the copyrighted work you used weighs: *in favor of fair use*

Factor 3

Your consideration of the amount and substantiality of your use of the copyrighted work weighs: *in favor of fair use*

Factor 4

Your consideration of the effect or potential effect on the market after your use of the copyrighted work weighs: *in favor of fair use*

Based on the information you provided, your use of the copyrighted work weighs: *in favor of fair use*



Draft 09/01/2009

(Questions? Concerns? Contact Gail McMillan, Director of the Digital Library and Archives at Virginia Tech's University Libraries: gailmac@vt.edu)

(Please ensure that Javascript is enabled on your browser before using this tool.)

Virginia Tech ETD Fair Use Analysis Results

This is not a replacement for professional legal advice but an effort to assist you in making a sound decision.

Name: Kongkun Charoenvisal

Description of item under review for fair use: Figure 2-20: Schematic structure of an Expert System (ES). Source: Turban, Efraim, Jay E. Aronson, Ting-Peng Liang, and Ramesh Sharda. 2007. Decision Support and Business Intelligence Systems. 8 ed. Upper Saddle River, NJ: Pearson Prentice Hall.

Report generated on: 09-11-2013 at : 23:17:54

Based on the information you provided:

Factor 1

Your consideration of the purpose and character of your use of the copyright work weighs: *in favor of fair use*

Factor 2

Your consideration of the nature of the copyrighted work you used weighs: *in favor of fair use*

Factor 3

Your consideration of the amount and substantiality of your use of the copyrighted work weighs: *in favor of fair use*

Factor 4

Your consideration of the effect or potential effect on the market after your use of the copyrighted work weighs: *in favor of fair use*

Based on the information you provided, your use of the copyrighted work weighs: *in favor of fair use*



Draft 09/01/2009

(Questions? Concerns? Contact Gail McMillan, Director of the Digital Library and Archives at Virginia Tech's University Libraries: gailmac@vt.edu)

(Please ensure that Javascript is enabled on your browser before using this tool.)

Virginia Tech ETD Fair Use Analysis Results

This is not a replacement for professional legal advice but an effort to assist you in making a sound decision.

Name: Kongkun Charoenvisal

Description of item under review for fair use: Figure 3-2: Value analysis. Source: Keen, Peter G. W. 1980. Value Analysis : Justifying Decision Support Systems, Cisar 64. Cambridge, Mass.: Center for Information Systems Research, Alfred P. Sloan School of Management.

Report generated on: 09-11-2013 at : 23:21:17

Based on the information you provided:

Factor 1

Your consideration of the purpose and character of your use of the copyright work weighs: *in favor of fair use*

Factor 2

Your consideration of the nature of the copyrighted work you used weighs: *in favor of fair use*

Factor 3

Your consideration of the amount and substantiality of your use of the copyrighted work weighs: *in favor of fair use*

Factor 4

Your consideration of the effect or potential effect on the market after your use of the copyrighted work weighs: *in favor of fair use*

Based on the information you provided, your use of the copyrighted work weighs: *in favor of fair use*



Draft 09/01/2009

(Questions? Concerns? Contact Gail McMillan, Director of the Digital Library and Archives at Virginia Tech's University Libraries: gailmac@vt.edu)

(Please ensure that Javascript is enabled on your browser before using this tool.)

Virginia Tech ETD Fair Use Analysis Results

This is not a replacement for professional legal advice but an effort to assist you in making a sound decision.

Name: Kongkun Charoenvisal

Description of item under review for fair use: Figure 3-4: Quality requirements. Source: Pressman, Roger S. 2010. Software Engineering : A Practitioner's Approach. 7th ed. New York: McGraw-Hill Higher Education.

Report generated on: 09-11-2013 at : 23:23:48

Based on the information you provided:

Factor 1

Your consideration of the purpose and character of your use of the copyright work weighs: *in favor of fair use*

Factor 2

Your consideration of the nature of the copyrighted work you used weighs: *in favor of fair use*

Factor 3

Your consideration of the amount and substantiality of your use of the copyrighted work weighs: *in favor of fair use*

Factor 4

Your consideration of the effect or potential effect on the market after your use of the copyrighted work weighs: *in favor of fair use*

Based on the information you provided, your use of the copyrighted work weighs: *in favor of fair use*



Draft 09/01/2009

(Questions? Concerns? Contact Gail McMillan, Director of the Digital Library and Archives at Virginia Tech's University Libraries: gailmac@vt.edu)

(Please ensure that Javascript is enabled on your browser before using this tool.)

Virginia Tech ETD Fair Use Analysis Results

This is not a replacement for professional legal advice but an effort to assist you in making a sound decision.

Name: Kongkun Charoenvisal

Description of item under review for fair use: Figure 3-5: Design pyramid for WebApps. Source: Pressman, Roger S. 2010. Software Engineering : A Practitioner's Approach. 7th ed. New York: McGraw-Hill Higher Education.

Report generated on: 09-11-2013 at : 23:25:27

Based on the information you provided:

Factor 1

Your consideration of the purpose and character of your use of the copyright work weighs: *in favor of fair use*

Factor 2

Your consideration of the nature of the copyrighted work you used weighs: *in favor of fair use*

Factor 3

Your consideration of the amount and substantiality of your use of the copyrighted work weighs: *in favor of fair use*

Factor 4

Your consideration of the effect or potential effect on the market after your use of the copyrighted work weighs: *in favor of fair use*

Based on the information you provided, your use of the copyrighted work weighs: *in favor of fair use*



Draft 09/01/2009

(Questions? Concerns? Contact Gail McMillan, Director of the Digital Library and Archives at Virginia Tech's University Libraries: gailmac@vt.edu)

(Please ensure that Javascript is enabled on your browser before using this tool.)

Virginia Tech ETD Fair Use Analysis Results

This is not a replacement for professional legal advice but an effort to assist you in making a sound decision.

Name: Kongkun Charoenvisal

Description of item under review for fair use: Figure 3-6: Testing process for WebApps. Source: Pressman, Roger S. 2010. Software Engineering : A Practitioner's Approach. 7th ed. New York: McGraw-Hill Higher Education.

Report generated on: 09-11-2013 at : 23:27:19

Based on the information you provided:

Factor 1

Your consideration of the purpose and character of your use of the copyright work weighs: *in favor of fair use*

Factor 2

Your consideration of the nature of the copyrighted work you used weighs: *in favor of fair use*

Factor 3

Your consideration of the amount and substantiality of your use of the copyrighted work weighs: *in favor of fair use*

Factor 4

Your consideration of the effect or potential effect on the market after your use of the copyrighted work weighs: *in favor of fair use*

Based on the information you provided, your use of the copyrighted work weighs: *in favor of fair use*



Draft 09/01/2009

(Questions? Concerns? Contact Gail McMillan, Director of the Digital Library and Archives at Virginia Tech's University Libraries: gailmac@vt.edu)

(Please ensure that Javascript is enabled on your browser before using this tool.)

Virginia Tech ETD Fair Use Analysis Results

This is not a replacement for professional legal advice but an effort to assist you in making a sound decision.

Name: Kongkun Charoenvisal

Description of item under review for fair use: Table 2-8: Generic green roof categories and types. Source: Grant, Elizabeth Joyce. 2007. "A decision-making framework for vegetated roofing system selection." In VPI & SU Architecture Ph D 2007. Blacksburg, Va.: University Libraries, Virginia Polytechnic Institute and State University,. <http://scholar.lib.vt.edu/theses/available/etd-11062007-232745>.

Report generated on: 09-11-2013 at : 23:12:15

Based on the information you provided:

Factor 1

Your consideration of the purpose and character of your use of the copyright work weighs: *in favor of fair use*

Factor 2

Your consideration of the nature of the copyrighted work you used weighs: *in favor of fair use*

Factor 3

Your consideration of the amount and substantiality of your use of the copyrighted work weighs: *in favor of fair use*

Factor 4

Your consideration of the effect or potential effect on the market after your use of the copyrighted work weighs: *in favor of fair use*

Based on the information you provided, your use of the copyrighted work weighs: *in favor of fair use*

