

CIIR ACTIVITIES

1 November 2005 – 31 March 2006

Overall objective: During the period under consideration, the main focus of CIIR activities was on: completing I*I course teaching for MCA degree at S.N.D.T. Women's University, Mumbai, offering I*I Continuing Education Program (CEP) Certificate courses, networking with institutions/industries, and on researching I*I implications for the issues of complex errors, information evaluation, and dynamic decision-making. These education and research initiatives are leading to rapid growth in I*I research initiatives involving a wider research community.

Overview of Main CIIR Activities: From November 1, 2005 – March 31, 2006, CIIR pursued research & education activities of: (1) Completion of Information Integrity Course Teaching at PG Dept. of Computer Science, S.N.D.T. Women's University, Mumbai; (2) I*I Paper submissions at The 3rd IEEE Conference ICMIT2006 scheduled at Singapore, June 21-23, 2006; (3) I*I Paper submission at International Conference BAI2006 organized by ATISR at Singapore, 12-14 July 2006; (4) Presentation of I*I papers at International/ National Conferences at IIT Guwahati, Delhi College of Engineering, IIT Delhi, etc; (5) I*I Research Papers Published in Journal/Book; (6) I*I Research Interactions; (7) Networking with institutions, industries, and professionals to initiate I*I research and education programs; (8) Delivering faculty seminar at Sinhgad Technical Society's College of Engineering, Pune on the topic of Information Integrity; (9) I*I Course Offering under Continuing Education Program (CEP) activity at CIIR, Pune; (10) I*I Course Offering under Continuing Education Program (CEP) activity at PG Dept. of Computer Science, S.N.D.T. Women's University, Mumbai; (11) Initiation of Master's project in I*I; (12) Doctoral research in I*I; (13) Meeting with Dr. Sri Ramamoorti during his visit to Mumbai in February 2006; (14) Work on a comprehensive I*I Research Paper; (15) Further strengthening of I*I Research Web Site at CIIR; and (16) Editing of CIIR's Research Publications.

These activities are briefly described here.

1. **Completion of Information Integrity Course Teaching at PG Dept. of Computer Science, S.N.D.T. Women's University, Mumbai**

Post Graduate (PG) Department of Computer Science, S.N.D.T. Women's University, Juhu Campus, Mumbai has introduced "Information Integrity" course as an elective course category under the University's Master of Computer Applications (MCA) degree program.

The first offering of I*I course was in the 1st Semester of the Academic Year 2005-06, which was from June 24, 2005 – 12 December 2005.

Prof. Vijay V. Mandke was invited to teach the course. He was assisted by Prof. Silven Simon, Prof. (Ms.) Anita D. and Prof. (Ms.) Sulbha Powar of the PG Dept. of Computer Science, S.N.D.T. Women's University, in this course teaching activity.

Information Integrity course lectures were delivered weekly from June 24, 2005 – November 25, 2005. The end semester examination for the course was on December 12, 2005. The semester results were announced by the University in February 2006. Total 4 students had registered for the course; all were successful.

2. **I*I Paper submissions at The 3rd IEEE Conference ICMIT2006 scheduled at Singapore, June 21-23, 2006**

The 3rd IEEE International Conference on Management of Innovation (ICMIT2006) will be held at Singapore from June 21-23, 2006. ICMIT2006 (www.icmit.net) continues a series of international conferences (ICMIT2000, ICMIT2002 and IEMC2004) devoted to the area of innovation and technology management first initiated by the IEEE Engineering Management Society Singapore Chapter. These conferences aim to provide a platform for international scholars to meet and exchange ideas.

During the CIIR Activity Overview period under consideration (November 1, 2005-March 31, 2006), CIIR's I*I Research Group members from Pune and Delhi worked on following papers for submission at the IEEE Conference.

- a) "Information System's View of Biometric Analysis" by Manisha Dale, Kashinath Munde, R.M. Bodade, and Natasha Kapoor.
- b) "Information Integrity Knowledge Development- A Critical Requirement" by Milind Mali, Reema Khurana, S. P. Kallurkar, and Vijay V. Mandke.

3. I*I Paper submission at International Conference BAI2006 organized by ATISR at Singapore, 12-14 July 2006

ATISR - Academy of Taiwan Information Systems Research is a researcher community based on Taiwan and serves for scholars around the world from all business and information fields. ATISR sponsors the following academic activities: International Journal of Business and Information (in English) (IJBI), Contemporary Management Research (in English) (CMR), Business And Information (BAI) Int'l Conference (in English), Taiwan conference on Business and Information (in Chinese) (TBI), and Electronic Commerce and digital life conference (in Chinese) (EC).

Business And Information (BAI2006; <http://bai2006.atistr.org>), to be held by ATISR at Singapore from July 12-14, 2006, is sponsored by Department of Marketing, Hong Kong Baptist University, National Taipei University, and Shih-Chien University.

BAI2006 conference received 505 manuscripts from 40 countries around the world. Paper selection process was based on recommendations of two blind reviews. During the CIIR Activity Overview period under consideration (November 1, 2005-March 31, 2006), CIIR's I*I Research Group members from Pune and Delhi worked on following paper, which is accepted for the conference.

- a) "Achieving comparative economic advantage through Information Integrity" by Reema Khurana, Natasha Kapoor, and Vijay Mandke.

4. Presentation of I*I papers at International/ National Conferences

CIIR research group members presented following I*I research papers at various international/national conferences that were held during the period under consideration.

- a) M. S. Mali, Dr. S. P. Kallurkar & Dr. V. V. Mandke, 9th to 12th December, 2005, "Informational Ergonomics in Product Design: An Information Integrity View", Proceedings of an International Ergonomic Conference 2005 HWWE on "Humanizing Work and Work Environment", Indian Institute of Technology, Guwahati, INDIA.
- b) M. S. Mali, Dr. S. P. Kallurkar & Dr. V. V. Mandke, 12th to 14th December, 2005, "Addressing high performance system by adapting an information integrity approach", Proceedings of an ISME International Conference on "Mechanical Engineering. Knowledge Management", Delhi College of Engineering, Delhi, INDIA.
- c) M. S. Mali, Dr. S. P. Kallurkar & Dr. V. V. Mandke, 12th to 15th December, 2005, "Designing systems for global products in local markets: an information integrity based approach", Proceedings of an International Conference on

“Productivity Research & Quality” , Indian Institute of Technology, Delhi, INDIA.

- d) M. S. Mali, Dr. S. P. Kallurkar & Dr. V. V. Mandke, 7th to 9th January, 2006, “Uncertainties due to ‘5C’s in product design”, Proceedings of a National Conference on “Advanced Manufacturing Processes”, Kolhapur Institute of Technology, Kolhapur, INDIA .
- e) M. S. Mali, Dr. S. P. Kallurkar & Dr. V. V. Mandke, 17th to 18th February, 2006, “Product Design Integrity: An Information Integrity View”, Proceedings of a National conference on “Design for Product Life Cycle” at Birla Institute of Technology, Pilani, INDIA.

5. I*I Research Papers Published in Journal/Book

During the period under consideration, following I*I research papers were published:

- (i) in Paradigm, The Journal of IMT, Ghaziabad, India
 - a. V. V. Mandke, *Information Integrity: Adding Value to Corporate Assets*, in Paradigm, D. P. Goyal Ed., The Journal of IMT, Ghaziabad, India, January-June, 2005, Volume IX, No.1, pp. 38-50.
 - b. K. Narayanan, V. V. Mandke, and M. Prashanth, *A Process Model For Decision-Making In Stock Markets: The Information Integrity Approach*, in Paradigm, D. P. Goyal Ed., The Journal of IMT, Ghaziabad, India, January-June, 2005, Volume IX, No.1, pp. 51-55.
 - c. Reema Khurana, *Information Integrity for Achieving Integrity in Databases for Open Systems*, in Paradigm, D. P. Goyal Ed., The Journal of IMT, Ghaziabad, India, January-June, 2005, Volume IX, No.1, pp. 56-61.
 - d. M. S. Mali, *Achieving Integrity in System Design: An Information Integrity View*, in Paradigm, D. P. Goyal Ed., The Journal of IMT, Ghaziabad, India, January-June, 2005, Volume IX, No.1, pp. 62-65.
 - e. Kamna Malik, *Information Integrity Analysis and Design: A UML based Approach*, in Paradigm, D. P. Goyal Ed., The Journal of IMT, Ghaziabad, India, January-June, 2005, Volume IX, No.1, pp. 66-70.
- (ii) in Book “Productivity and Quality- A Multidisciplinary Perspective”, Tata-McGraw-Hill Book, New Delhi, 2006
 - a. M. S. Mali, Dr. S. P. Kallurkar & Dr. V. V. Mandke, 12th to 15th December, 2005, “*Designing systems for global products in local markets: an information integrity based approach*”, in “Productivity and Quality- A Multidisciplinary Perspective”, V. Upadhyay, Anuradha Sharma, Seema Sharma, Sudhir K. Jain, and David J. Sumanth Eds., Tata McGraw-Hill, New Delhi, 2006, pp. 563-572.

6. I*I Research Interactions

During the period under consideration, following I*I research interactions were undertaken:

- a. In December 2005:
 - i. I*I research interactions at IMT Ghaziabad between Reema Khurana, Milind Mali, and Vijay Mandke,
 - ii. I*I research interactions between Ms Charu Malhotra, Indian Institute of Public Administration (IIPA), New Delhi, Natasha Kapoor, MCA student of SNDT Women’s University, Mumbai, and Prof. Vijay Mandke,
 - iii. I*I research interaction between Dr. B. S. Panda (IIT Delhi) and Prof. Vijay Mandke, at IIT Delhi,

- iv. With Natasha Kapoor, MCA student of SNDT University, Mumbai, library search at IIT Delhi.
- b. In February 2006:
 - i. I*I research interaction with Reema Khurana, IMT, Ghaziabad.

7. Networking with institutions, industries, and professionals to initiate I*I research and education programs

CIIR is networking with institutions, industries, and professional from Delhi (IIT Delhi inclusive), Pune (University of Pune inclusive) and from Bombay (S.N.D.T. University, IIT Bombay inclusive) to develop and to implement education and research in I*I. Within this framework, Prof. Mandke and I*I researchers had following notable meetings/workshop participation during the period under consideration.

- (a) Meeting at Baja Auto Ltd., Akurdi, Pune on January 25, 2006 in which following participated:
 - i. Mr. Pradipta Kumar Rath, General Manager, Learning Center, Bajaj Auto Ltd., Akurdi, Pune,
 - ii. Dr. Shrikant P. Kallurkar, Principal, Imperil College of Engineering, Pune,
 - iii. Mr. Milind Mali, Assistant Professor, Dept. of Mechanical Engg., SKN College of Engineering, Sinhadgad Technical Education Society, Pune,
 - iv. Ms. Natasha Kapoor, VI th Semester Master of Computer Applications (MCA) Degree student of SNDT Women's University, Mumbai, and Six-Month I*I Technology Development Project student at CIIR, Pune, and
 - v. Prof. Vijay V. Mandke.

Note: The meeting discussed the roadmap for Ph. D. support work for Mr. Milind Mali at Bajaj Auto Ltd., Akurdi, Pune. Mr. Mali is registered for Ph. D. in Production Engineering at Pune Institute of Engineering & Technology Center, University of Pune, for thesis titled "Product Design for Changing and Complex Environment: An Information Integrity Based Approach" under the guidance of Dr. S. P. Kallurkar, Principal, Imperial College of Engineering, Pune.

- (b) Meeting with officials of Imperial College of Engineering, Pune on 25 January 2006,
- (c) Address by Prof. Vijay Mandke on the topic "Data Interpretation" to students of Hiraben Nanavati Institute of Management and Research for Women on February 4, 2006.
- (d) Participation by Prof. Vijay Mandke, Mr. Milind Mali and Natasha Kapoor in Workshop on TPM, held at Concentric Pump, Pune by Nagar Road Industries Chamber of Commerce & Agriculture, Pune on March 4, 2006.
- (e) Participation by Prof. Vijay Mandke and Natasha Kapoor in One Day Seminar on "Leveraging PLM for becoming Manufacturing Destination of The World", organized by G. S. Moze College of Engineering, Balewadi, Pune-45 on March 11, 2006.
- (f) In the month of March 2006, I*I researchers had meetings with following experts:
 - i. Prof. Bharat Chaudhary, International Institute of Information Technology, Pune, and
 - ii. Prof. Smita Vaze, Hiraben Nanavati Institute of Management and Research for Women, Pune.

8. Delivering faculty seminar at Sinhadgad Technical Education Society's College of Engineering, Pune on the topic of Information Integrity

On January 28, 2006, Prof. Mandke delivered a faculty seminar at the Dept. of Mechanical Engineering of College of Engineering, Sinhgad Technical Education Society, Pune on the topic of "Information Integrity – Research & education Issues.

9. I*I Course Offering under Continuing Education Program (CEP) activity at CIIR, Pune

From September 10, 2005, Prof. Vijay Mandke is conducting I*I course at CIIR, Pune. The course is under the Continuing Education Program (CEP) Activity of CIIR for the faculty of the engineering colleges and other institutions at Pune. Objectives of the Semester long I*I course offering are: (a) Faculty development for research in I*I, (b) Faculty development for I*I education, (c) Development of I*I research desk at institutes in the region, and (d) Planning for I*I Seminar at National level.

The current batch for the CEP Certificate course session starting September 10, 2005 comprises:

- (i) Professor (Ms.) Manisha Dale, Head, Dept. of Electronics, Wadia College of Engg., Pune,
- (ii) Professor Milind Mali, Asst. Prof. in Mechanical Engineering Institute, Smt. Kashibai Navale College of Engineering, Sinhgad Technical Education Society, Pune,
- (iii) Professor Gajanan Patil, Faculty, Dept. of Electronics, Armament Institute of Technology, Pune,
- (iv) Professor Pandurang Patil, Head, Dept. of Electronics, AISSMS's College of Engg., Pune,
- (v) Professor Vijay Thorat, Head, Dept. of Civil Engg., AISSMS's College of Engg., Pune, and
- (vi) Professor Kashinath Munde, Dept. of Mechanical Engg., Wadia College of Engg., Pune.

I*I CEP Certificate course is conducted at the CIIR's Pune Center. I*I course lectures are scheduled weekly on Saturday and Sunday and during vacation time for the participating faculty/candidates. The course is expected to be completed by the end of May 2006.

On successful completion of the course, CEP certificates would be awarded to the participating candidates.

10. I*I Course Offering under Continuing Education Program (CEP) activity at PG Dept. of Computer Science, SNDT Women's University, Mumbai

From January 2006, Prof. Vijay Mandke is conducting I*I Continuing Education Course at PG Dept. of Computer Science, SNDT Women's University, Mumbai. Conducted as the Continuing Education Program (CEP) Activity of CIIR for the faculty of universities and colleges, the course is semester long and two faculty members of the PG Dept. of Computer Science, SNDT Women's University, with interest to do further research in I*I are attending the course. These faculty are:

- (i) Prof. (Ms) Anita D., and
- (ii) Prof. (Ms) Sulbha Powar

11. Initiation of Master's project in I*I

Ms. Natasha Kapoor, student of Master of Computer Applications (MCA) Degree, PG Dept. Of Computer Science, SNDT Women's University, Mumbai, attended I*I Course at SNDT University from 24 June – 12 December 2005. Following this, currently during her VI th and the final Semester of MCA Degree, she is doing her project work at CIIR.

Specifically, from 1 January – 15 June 2006, Natasha is working on her six-month I*I Technology Development Project at CIIR, Pune.

Further, during VI th Semester, Natasha is also doing her Seminar course work on the topic of “Complex Errors”.

Appendix A gives a brief problem statement of the proposed I*I Technology Development project work, and Appendix B a brief description of the proposed Seminar Work on “Complex errors”.

12. Doctoral research in I*I

(a) From July 2003, Ms. Reema Khurana, Computer Science Faculty of Institute of Management Technology (IMT), Ghaziabad, Delhi is registered at S.N.D.T. Women’s University, Mumbai, for her Doctoral work in the topic “*Achieving I*I for Open System Data Bases*”. Dr. Ramesh, Professor of Computer Science & Engineering, IIT Bombay, and Professor Vijay Mandke are her joint guides.

- **Guiding Ph. D. research**

Prof. Mandke is actively engaged in guiding Ms. Khurana in her doctoral work progress.

Note: This is a continuing activity.

(b) From August 9, 2005, Mr. Milind Mali, Assistant Professor, Dept. of Mechanical Engg., Smt. Kashibai Navale College of Engg., Sinhadgad Technical Education Society, Pune is registered for Ph. D. in Production Engineering at Pune Institute of Engineering & Technology Center, University of Pune, for thesis titled “*Product Design for Changing and Complex Environment: An Information Integrity Based Approach*” under the guidance of Dr. S. P. Kallurkar, Principal, Imperial College of Engineering, Pune.

- **I*I Experts support for Ph. D. research**

Prof. Mandke is engaged in providing knowledge support for Mr. Milind Mali in his doctoral work progress.

Note: This is a continuing activity.

13. Meeting with Dr. Sri Ramamoorti during his visit to Mumbai in February 2006

In February 2006, Dr. Sri Ramamoorti, Partner, Corporate Governance Grant Thornton LLP and of IIC visited Mumbai, India. At that time, on February 15, 2006, Vijay and Natasha met him at Mumbai.

During the meeting, Vijay gave Sri an overview of CIIR’s ongoing research and education activities with particular reference to delivery of I*I courses at IIT Bombay and at SNTD Women’s University, Mumbai. Further, Vijay also described to Sri emerging design perception of I*I Technology, progress on continuing education program initiative at Pune Center, and shared with him information on CIIR’s I*I research paper publication initiatives.

Natasha presented to Sri details of her progress in the I*I Technology Development Project work at CIIR, Pune as also her progress on Complex Errors seminar work.

14. Work on a comprehensive I*I Research Paper

Currently Vijay is also working on a comprehensive research paper entitled “Systems Engineering of Information Integrity”.

15. Further strengthening of I*I Research Web Site at CIIR

Work for development of I*I Research Web Site is complete. The site address is: www.centerforinformationintegrityresearch.org.

Currently the site is being further strengthened by introducing a facility of “Discussion Forum” for the expanding research community.

16. Editing of CIIR’s Research Publications

CIIR is working on strengthening the task of editing its research publications.

Appendix A

A brief problem statement of the proposed I*I Technology Development project work at CIIR by Natasha Kapoor, MCA Student, PG Dept. of Computer Science, SNDT Women’s University, Mumbai:

Natasha Kapoor, Student of MCA (batch 2003-06), SNDT Women’s University, Mumbai, is taking up a technology development project (Semester VI , starting Jan 06) in Center for Information Integrity Research, Pune Center, under Dr. V.V Mandke’s guidance.

The project studies the problem of Information Integrity technology development for an effective and economic business process in the phase where customer requirements are instant and local. The issue is of designing and implementing business process in complex and changing environment where there is a shift from Customer Relationship Management (CRM) to Customer Continuity Planning (CCP). Normally CRM is the requirement for competitive advantages in business process characterized by static and linear, extrapolatable environment. In the present market scenario the business processes are customer centric. Keeping this in mind the system would be designed to accommodate customer requirements (local and instant).

The first step in the project would be to develop context and domain specific environment. This is the requirement/Information Topology. The project will recognize that the real world business implementation opens the business process to the consequence of ever-present individual decisions situations. These situations are the indicators of dynamism and complexity of the environment. The environment is the sum total of all the individual domain specific sub-environment.

The design and implementation of traditional business processes are done in static environment, characterized by collective decision phenomena. In the effort to improve Information Integrity one would continuously evolve (decision) and process individual information, in order to have effective and economic advantage.

The project argues that the above individual decision situation model is impacted by uncertainty that one needs to deal with. The analysis of consequences of system behavior, showcase the problem in the system itself. Towards this we consider the application of System Dynamics Methodology, facilitating simulation and computation of its consequences for system effectiveness.

Appendix B

A Brief Description of Proposed Seminar Work by Natasha Kapoor, MCA Student, PG Dept. of Computer Science, SNDT Women’s University, Mumbai, on the topic of “Complex Errors”:

I intend to study theory of complex errors and its mechanism in software development life cycle. I would be studying the errors that take place at all phases (namely requirements, design, implementation, testing, maintenance) of the SDLC.

The paper would provide a good Taxonomy of errors and map them to SDLC. I intend to put forward the scenarios where unobservable errors have taken place and have resulted in failures or accident.

What is an error?

From the viewpoint of an external observer, an error can be seen as a failure to ensure an optimum, desired, or intended value that is correct given the circumstances (situation), the cause and form of error notwithstanding. An error can occur only if there is an appropriate identified source of value (standard) to ensure on the basis of a documented state of events.

The errors are characterized by the following properties:

- (a) (a) A latent error becomes defective when it is activated.
- (b) (b) An error may oscillate between its latent and effective states.
- (c) (c) An error may, and in general does, propagate from one component to another and creates new errors while propagating.

Much of the discussion about errors in any application domain (sector), is confusing or confused because of the differences in terminology used by the discussants. One person's error may be other person's accident. One person's slip may be other person's mistake. A generally accepted, standard terminology is yet to be established.

One can say that it is a deviation from the standards. But are the standards correct? One can have real life experiences with errors in day to day life.

Following is a case recorded: A warehouse disappeared – not from physical view but from the watch eyes of a well-known retailer's automated distribution system. A software glitch had somehow erased the warehouse's existence, so that goods destined for that warehouse were rerouted somewhere else, while goods at the warehouse languished. The company was in financial trouble and had been shuttering other warehouses to save money, the employees at the "missing" warehouse kept quiet. For three years, nothing arrived at the warehouse or nothing left from it. The employees were getting their paychecks, however because a different computer system handled the payroll. When the software glitch finally came to light, the merchandise in the warehouse was sold off.

There are three levels of errors:

- Mechanical and Electronics- This is a primary level error that take place in the electronic gadgets. The object fails to perform the task it is designed for. They are random service error. They are functional errors.
Note: Observable errors are errors that can be anticipated.
- Equipment – This is secondary level error. They are functional and observable.
Hardware faults include:
 - unstable power supplies,
 - failure of cooling system,
 - faults in disk memory, I/O channels, CPU registers,
 - failure of any peripherals, etc.

A fault creates a latent error in the component where it occurs. A failure occurs when the error results in unacceptable service as perceived by the user of the system.

Coming to software failures, they could be due to faults such as:

- (i) design errors in the original programs,
 - (ii) change in requirements but not accounted for the change in the phases after that,
 - (iii) errors introduced while modifying software,
 - (iv) errors on testing,
 - (v) errors introduced due to transient hardware errors which corrupt the stored program, etc.
- Informational – It is at the tertiary level. Presence of IS can make one value the importance of information. So, when information originated is incorrect we say that informational error has taken place. These are observable and unobservable errors. In case of complex information processing situations, IS errors, amongst others, are caused by
 - (a) difficulty in dealing with multiple goals and many factors and uncertainty accompanying them resulting in incorrect statement of information variables.
 - (b) difficulty in estimating time sequences (forecasts) of these information variables.

Traditionally, the IS environment is considered static. The primary and secondary error is modeled as:-

- (a) Deviation from “Exactness” aspect of information processed.
- (b) Implications of “noise.”
- (c) Deviation from the required (standard) function/operation of the component, sub-system, or the system.
- (d) The mechanism by which the fault becomes apparent, i.e., observable.
- (e) The system failure concern is only in terms of functional, i.e., observable failures.

But in changing complex environment, tertiary error is defined as:-

- (a) Deviation from “Correctness” aspect of information processed.
- (b) Implications of “distortion” and “noise”.
- (c) A failure to ensure an optimum, desired, or intended value (for a view, format, variable, or process, etc. as the case may be) that is correct given the circumstances (situation), the cause and form of error notwithstanding. An error can occur only if there is an appropriate identified source of value (standard) to ensure on the basis of a documented state of events.
- (d) The system failure concern goes beyond functional, i.e., observable failures and includes Decision Failures from:

- Design errors, Development errors, Deployment errors, Data errors and Detection errors, Implementation errors, testing errors and maintenance errors.
- Errors in originating maximal information requirements, etc.

Note: These errors, which in fact are information errors, and decision failures there from, both, are unobservable. It is risks from these decision failures that are crucial to loss of strategic advantage.

Software failures are the result of not being able to deal with complex latent errors during development life cycle.

Why are we talking about software errors?

Software is everywhere. It's what let's one take out money from ATM, make phone call and drive a car. It is estimated that a cellphone contains 2 million lines of code.

On an average a company spends 4 to 5 percent of revenue on IT. While those that are highly IT dependant such as telecommunication and financial companies have IT expenditure more than 10 percent, Government bodies too are big consumers of software.

Why a plan/project fails? What error must have occurred which led to such a failure? Where did I take a wrong decision? and many other questions...would be answered through my seminar.

In wholesome, these complex errors account for the software failures that have taken place at some point in SDLC, where simple error in one phase can lead to complex errors at the other.

My aim is to study the theory of complex errors and combine each phase of SDLC with case study wherein the errors have taken place. Concluding with a cookbook of precautions one should take to minimize errors.

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