Invited Talks

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A Framework for Hybrid Research Paradigm (HRP) and Sample Researches

Ghazi Alkhatib

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A Framework for Hybrid Research Paradigm (HRP) and Sample Researches

GHAZI ALKHALIF
FOUNDER AND EDITOR-IN-CHIEF - THE INTERNATIONAL JOURNAL OF IT AND WEB ENGINEERING, SINCE INAUGURATION 2006

KEYNOTE SPEECH

THE 8TH INTERNATIONAL CONGRESS OF INFORMATION AND COMMUNICATION TECHNOLOGY (ICICT2018) XIAMEN, CHINA
JANUARY 27-28, 2018
Speech Motivation

MY ACADEMIC PORTFOLIO: MIXING BUSINESS, INFORMATION SYSTEMS, STATISTICS, AND COMPUTER SCIENCE

MY JOURNAL: WEB ENGINEERING AND IT

MY RESEARCH: CONDUCTED RESEARCH ON LINKING DIFFERENT TECHNOLOGIES, CONCEPTS, TOOLS, AND METHODOLOGIES.
What is the definition of “Hybrid”

CAMBRIDGE DICTIONARY: “SOMETHING THAT IS A MIXTURE OF TWO VERY DIFFERENT THINGS.”

DICTIONARY.COM: “OF MIXED CHARACTER; COMPOSED OF DIFFERENT ELEMENTS.”
Examples of “Hybrid Systems”

“Such a hybrid system may employ data mining algorithms to populate a structured knowledge base that is also populated and edited by human contributors.” Computer example

“In a hybrid system, part of the system is read by fixed network, and parts may read by mobile or other technology, or both. Network example.” Source: Wikipedia

“We believe that the existing hybrid system of flat-rate contribution with a bit of earnings-related contribution on top has outlived its usefulness.” Business Example- Source: Hansard archive
Definition of “Paradigm”

**Merriam-Webster:** “a philosophical and theoretical framework of a scientific school or discipline within which theories, laws, and generalizations and the experiments performed in support of them are formulated the Freudian paradigm of psychoanalysis; broadly : a philosophical or theoretical framework of any kind.”

**Dictionary.com:** “a framework containing the basic assumptions, ways of thinking, and methodology that are commonly accepted by members of a scientific community.”
Hybrid Research Paradigm

- Main themes: Innovation and Practice-Based Approaches: the sum of the parts is better than individual components.

- Common use: qualitative (QLR) vs. quantitative (QNR) research

- QLR: human behavior (subjective) both from the researcher point of view (understanding) and study subjects—individual, teams, organizations (expression and behavior), more in depth knowledge, introduction of bias in human-to-human communication.

- QNR: scientific (objective), bias in data representation for analysis for not meeting statistical assumption on sample size and population distribution, ease of replication, simulation, and conclusions, achieving objectivity.
My HRP Framework

- Tools Layer
- Application Layer
- Methodological layer
- Conceptual Layer
- Physical Layer
Hardware/Software co-design: Year 2-digit vs 4-digit — software developer never expected that OS will last that long. Hardware people were thinking of maximum utilization of limited memory.

Embedded controllers for reactive real-time applications

Investigates the concurrent design of hardware and software components of complex electronic systems. It tries to exploit the synergy of hardware and software with the goal to optimize and/or satisfy design constraints such as cost, performance, and power of the final product.

Strike a balance between flexibility and efficiency
Explaining the Layers
Key concepts – **Concurrent:** hardware and software developed at the same time on parallel paths – **Integrated:** interaction between hardware and software developments to produce designs that meet performance criteria and functional specifications

Faster integration: reduced design time and cost – Better integration: lower cost and better performance – Verified integration: lesser errors and re-spins

Examples: Elevator Controller, network management - Use of simulation of different co-design scenarios - IT and design & control of renewable energy systems
Conceptual Layer

▶ Applies to a type of research methodology that does not involve neither qualitative and/or quantitative research.
▶ A hybrid framework should integrate two or more concepts. Examples:
  ▶ Web services, composite web service - knowledge management, databases, Expert Systems, Decision Support Systems, organization learning – network, software agent (multiple / intelligent) – web services, Portal Technologies
  ▶ Workflow management, time management, software agents, data base management system
  ▶ Intelligent user interface and Decision Support Systems, and/or Expert Systems, and/or eGovernment
  ▶ Communication system, human communication model, software development life cycle
  ▶ ISO, Knowledge Management Systems, IT (database development)
Methodological Layer

- Agile methods, CMMI, ISO
- Structured methodologies vs UML
Application Layer

- Creative thinking processes, Herrmann Brain Dominance Instrument, team types and management (quality, knowledge, innovative)

- Business Intelligence, human resource management

- Data mining/big data to each of social networks, ecommerce (access behavior and buying behavior), Customer Relationship Management (CRM), examine financial statements with big data search for possible bankruptcy.
Tool Layer

- Statistical methods, data mining, visualization
- SPSS, RapidMiner data mining tools
Examples from my research on each of the framework layers
Example 1: Conceptual Layer


Linking Intelligent Software Agents, data mining /BI, Web services, and e-Government

See next slide for the conceptual framework
Example 2: Conceptual Layer


Best paper presented in the session: Information Systems Development.

How and why agile software development emerged as an innovative approach

See next slide
Example 3: Conceptual Layer + Tools


See next slide for the framework.
The Backbone

HR Appraisal System DB

The Processes

Organization Learning - Creative team thinking processes - knowledge M. System - store individ/team performance evaluations and lessons learned

Expert System

HR data Mart - BI dashboard interface
Example 1: Methodological layer

Linking Agile Methods to CMMI

- Ghazi Alkhatib, “AGILE METHODS (AM) – CMMI-SW: LINKING THE TWO EXTREMES.” -
  “Agile Methods and CMMI-SW: Dancing Elephant on the Internet Zone” –


- Approached for linking AM to CMMI: front-end, embedded, backend (maintenance)
- See next slide for a framework from one paper for embedded approach
Figure 10. CMMI Capability levels interactions continuous process improvement achieving Agility

Distinguished Paper Award.

Linking team organizations and types, team performance, creative thinking process, Herrmann Brain Dominance Instrument (the four quadrants of brain) (Not the Tradition left and right): A, B, C, D (briefly explain next slide)

The HBDI® is a powerful psychometric assessment that defines and describes the way individual thinks and processes information.
Example 1: Application Layer The four quadrants explained

See next slide for the chart linking all components together
Team Leaders for every phase rotates based on creativity phase.
Methodology and Tools (programming languages)

Next paper “Virtual Teams on Demand” Using Team Formation Based on A B C D constructs (www.hbdi.com) with Dr. Omar Al-Humaidi, Consultant on Entrepreneurship Innovation processes and HBDI certified
The study is based on 230 actual HBDI measurements of employees of a major industrial company in the Gulf region.

Each employee takes an the Herrmann Brain Dominance Instrument (HBDI) test and generated report of the findings. See next slide for an example:

Just a brief clarification of numbers- (Profile score 8-189) (Preference code 1 Strong, 2 Secondary, 3 Tertiary) (adjective code: 24 points distributed among the four quadrants)
........ adjective pairs
_____ profile score
This presentation concentrates on profile score
Types of Team Functions

- **Quality Teams** generating quality ideas in solo functions: i.e. new marketing plan.

- **Knowledge Teams** generating Knowledge ideas through cross functional idea sharing. i.e. credit approval process: MKT, ACCT, and production), workflow analysis to reduce time and cost.

- **Innovative Teams** generating innovative ideas covering the whole organization. i.e. developing a new vision and strategic plan, entering new market.
Team Composition Based on Profile Scores: Each little circle indicates a member. Minimum no. of team size

Innovative Team

Knowledge Team

Quality Team
Virtual teams require strong IT infrastructure both hardware/networks and software/use or improve social networks for effective and efficient team management.
Example 1: Tool layer


Use of SPSS and RapidMiner (RM)

Use of statistical analysis (correlation, regression), datamining (SPSS and RM), and visualization.
The ISBSG (International Software Benchmarking Standards Group) is a not-for-profit organization. Our mission is to help YOU and your organization improve the planning and management of your IT software projects.

ISBSG Software Project Data Release 13 now available! The International Software Benchmarking Standards Group is very proud to announce that it has now released R13 of its New Developments and Enhancements (D&E) repository, containing the project data of 6,760 completed software realization projects, with 226 fields. Price $2,525 (Australian dollars) for a single user license.

Sample of the ISBSG Release 12
The ISBSG software metrics data can be used to assist in: Estimation, Benchmarking, Infrastructure planning, Bid planning, Outsourcing management, Standards compliance, & Budget support.

Data in the ISBSG repository allows you to address questions like:

- What is the industry productivity for Java projects in the banking sector?
- Is my organization better or worse than industry average?
- My supplier quotes a price per function point of 350 EUR. Is this realistic?
- My supplier says he can do this agile project in 6 months and with 5 people. How likely is it that he can do this? Was it ever done before?
- What would be an optimal average team size for an Oracle enhancement project of 80 function points?
- How much functionality will I probably get after 6 sprints of two weeks in an agile project with 4 team members.
## Correlations

<table>
<thead>
<tr>
<th>Variable</th>
<th>Effort AandD Percent of total</th>
<th>Resource Level</th>
<th>Defect Density</th>
<th>Speed of Delivery</th>
<th>Manpower Delivery Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Defects Delivered</td>
<td>-0.160*</td>
<td>0.084</td>
<td>0.477**</td>
<td>0.036</td>
<td>-0.043</td>
</tr>
<tr>
<td>Effort AandD Percent of total</td>
<td>1</td>
<td>-0.025</td>
<td>-0.113</td>
<td>-0.106</td>
<td>-0.141*</td>
</tr>
<tr>
<td>Resource Level</td>
<td>1</td>
<td>-0.092</td>
<td>0.204**</td>
<td>0.204**</td>
<td></td>
</tr>
<tr>
<td>Defect Density</td>
<td>1</td>
<td>1</td>
<td>-0.085</td>
<td>-0.104</td>
<td></td>
</tr>
<tr>
<td>Speed of Delivery</td>
<td>1</td>
<td>1</td>
<td>0.818**</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The cluster analysis identifies clusters 1, 5, 4, & 8 for the variables: Normalized Work Effort, Defect Density, Total Efforts, Total Defect Delivered

<table>
<thead>
<tr>
<th>Variables</th>
<th>Cluster</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Speed of Delivery</td>
<td></td>
</tr>
<tr>
<td>Effort A and D Percent of total</td>
<td>21</td>
</tr>
<tr>
<td>Normalised Work Effort</td>
<td>1797</td>
</tr>
<tr>
<td>Defect Density</td>
<td>27</td>
</tr>
<tr>
<td>Total Efforts</td>
<td>1631</td>
</tr>
<tr>
<td>Total Defects Delivered</td>
<td>4</td>
</tr>
<tr>
<td>Number of Cases/Cluster</td>
<td>195</td>
</tr>
</tbody>
</table>
Time dependent: total efforts
total defect delivered against speed of delivery
Next in my ISBSG-related research: non-linear estimation and outlier identification, detection, and removal
Example 2: Tool layer + Conceptual - 1


Use of qualitative research (QLR) and quantitative research (QNR).

QLR examined all strategic plan looking for components, check all evaluation. It also ensured data quality for the next step. QNR analyzed data using SPSS: correlation, regression, and factor analysis.
Example 2: Tool layer + Conceptual -2

Conclusions: SP does not follow a standard template, internal environment is the most critical components in SP, IT companies stress product development SP, Industry Type is more important than Region when formulation SP

See next slide for framework
Critical Success Factors in HRP Using Teams

- Communication
- Common shared knowledge
- Teams where each member is important – team leader rotation
Software Development Team Crisis

An Example of team communication:
Between team leader and team members.
Team leader is visionary but most team members are numeric math oriented.
Team leader was waiting for initiatives from team members, at the same time, team members were waiting for instructions from team leader.

Team failed
Source: http://www.mindtech3.com/services/profile_stories.html
Google Experiences
Google Common Frame of Reference for Software Development Teams in Goolge

Understand the code
The five key characteristics of enhanced teams

1. Dependability.
2. Structure and clarity.
3. Meaning.
4. Impact.
5. Psychological Safety.
1. Psychological safety: Can we take risks on this team without feeling insecure or embarrassed? D plays major part in communication – team leader rotation

2. Dependability: Can we count on each other to do high quality work on time? Integrating A B C D

3. Structure & clarity: Are goals, roles, and execution plans on our team clear? Role of A B

4. Meaning of work: Are we working on something that is personally important for each of us? Team leader rotation among A B C D

5. Impact of work: Do we fundamentally believe that the work we’re doing matters? Role of D C
End of Google related research and experiences
How the Best Teams are Built - Another view

1. Autonomy vs. Harmony (D vs. B) (Role of C)
2. Task-Focused vs. People-Focused (A vs. C)
3. Speedy vs. Steady (D & C vs. A & B)
5. Subjective vs. Objective (C & D vs. A & B)
When team building, seek **diversity** and cultivate transparency around varied work styles. A "super bowl" caliber team has top talent, but more importantly, they understand how to maximize it and play together in service of a common goal. **A well-balanced team in which members know and understand their roles** and are celebrated for their **unique contributions** can win together
Conclusions - 1

- Hybrid Research Paradigm is a multi-disciplinary, multi-functional, integrating concepts, applications, methodology, and tools for the purpose of achieving innovative ideas and new applications.

- The presentation included a framework developed by the speaker and cited several examples of his previous, current, and future research.
Conclusions 2

- HRP requires team approach for successful implementation
- AI team members should be given equal time for discussion and presenting ideas
- Collective team IQ is higher than the sum of individual IQ
- Google team research is highlighted
The presentation suggested to use some form of personality traits measurement, specifically the Herrmann Brain Dominance Instrument (www.HBDI.com) along with creative thinking processes to construct different types of teams.
My Time is Up

Q & A