An approach to developing a part-time PhD program in IT Architecture

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An approach to developing a part-time PhD program in IT Architecture

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iSAQB(International Software Architecture Qualification Board)

MEMBERS' MEETING 2015 AND SUBSEQUENT WORKSHOPS

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- AGH University of Science and Technology
  - Department of Applied Computer Science
  - Faculty of Electrical Eng., Automatics, Computer Sci. and Biomedical Eng.
- Previous experience
  - Founder and ATSI CEO 1997-2014 (300 employees)

Current interest

- Research
  - Enterprise Architecture modeling and scaling, IT System Architectures
- Teaching Computer Science graduate students
  - Business Modeling and Enterprise Architecture, Managing IT Projects, Cloud Computing
- Leading Postgraduate Studies
  - „IT Project Management"
- New initiatives:
  - IT Architecture Certified Courses
  - Part Time PhD Studies on IT Architecture in the Computer Science Domain

IT ARCHITECTURE ACADEMY

IT PhD STUDIES

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Case study- EA methodology tailored to a real SDC

- Architecture governance for medium-sized company (50-500 developers)
  - Bigger companies (over 500) usually create their own methodology strictly designed to their own needs
  - For small companies (less 50) the cost of introducing architecture governance may be bigger than the expected profits
- Development methodologies: classic (PMBOK), agile (Scrum) or lean (KANBAN) methodologies
- Depends (size, type of delivery, product uniformity, technology stack)

Diament miesięcznika Forbes 2014

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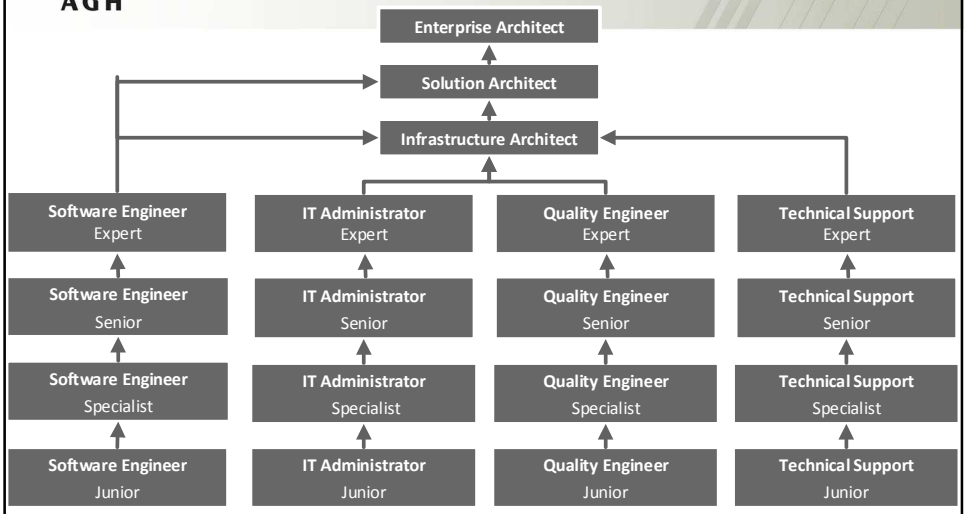
Distinguished activities of EA

1) defining a motivation model
2) adapting architecture modeling tools
3) creating an IT landscape
4) building architecture capabilities
5) implementing standards and guidelines
6) applying architecture governance
7) defining the architect's role
8) managing risk in IT solutions

Architectural positions developing



Tholons Top 100 Outsourcing destinations

Over the last year
- 6 thousand new workplaces were created in Krakow's services sector
- almost 100 business services companies present in Krakow
- employ 38 thousand people working for clients in 94 countries and using 36 languages.

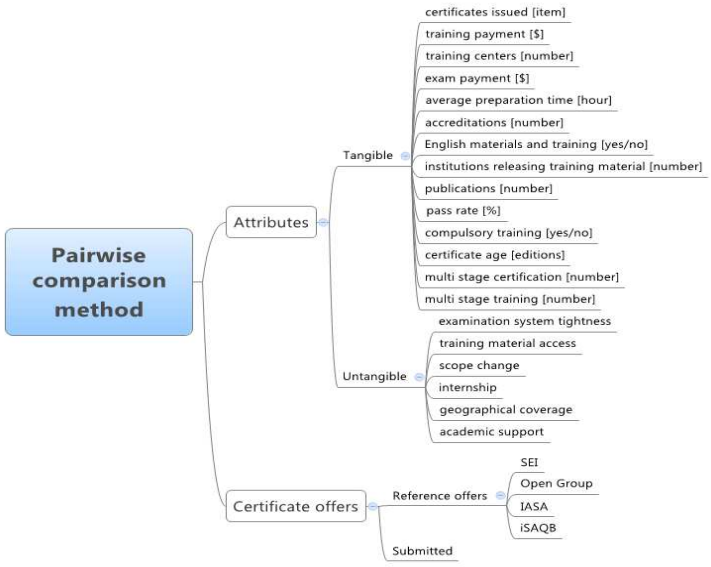
Overall Rankings

Rank 2014	Rank 2013	Movement	Region	Country	City
1	1	-	South Asia	India	Bangalore
2	3	+1	Southeast Asia	Philippines	Manila (NCR)
3	2	-1	South Asia	India	Mumbai
4	4	-	South Asia	India	Delhi (NCR)
5	5	-	South Asia	India	Chennai
6	6	-	South Asia	India	Hyderabad
7	7	-	South Asia	India	Pune
8	8	-	Southeast Asia	Philippines	Cebu City
9	10	+1	Eastern Europe	Poland	Kraków
10	9	-1	Western Europe	Ireland	Dublin

Certificates on Software Architecture

- SEI (Software Engineering Institute of Carnegie Mellon University)
  - Software Architecture Professional Certificate
- iSAQB (international Software Architect Qualification Board)
  - Certified Professional for Software Architecture (CPSA)
- IASA (International Association of Software Architects)
  - Certified Architect
- Open Group
  - Certified Architect

Certificates non-domain characterics



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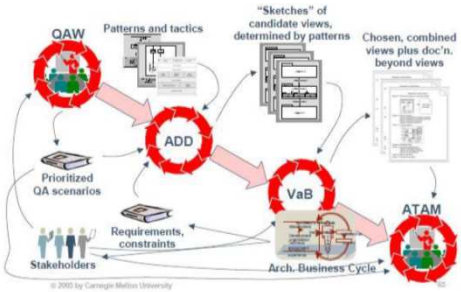
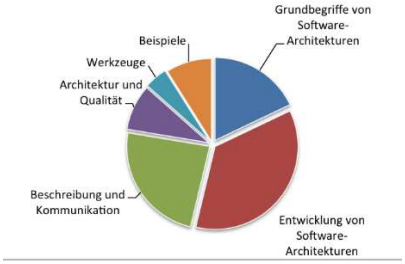
Authors certificates

SEI SAPP & iSAQB FL United?

- Integration Goal?





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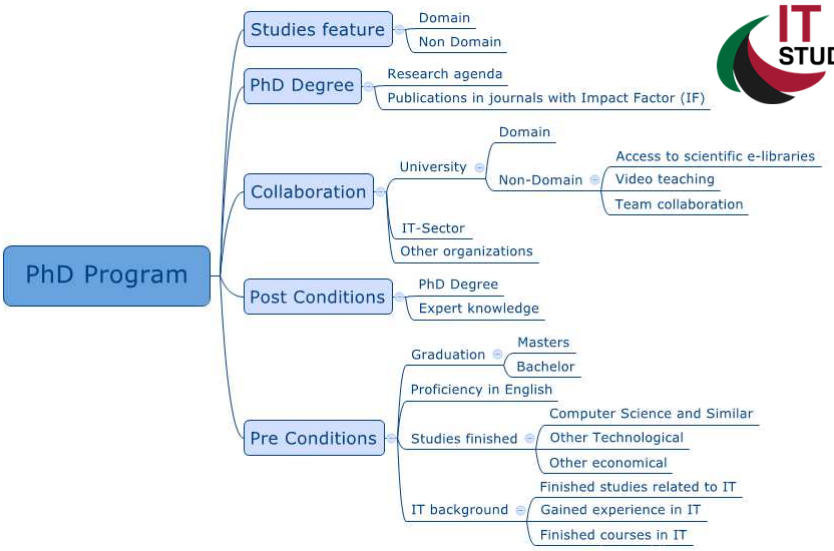
Workshops

Part Time PhD Studies
on IT Architecture in the Computer Science Domain



IT PhD STUDIES

werewka

Part-time Phd Studies
Distinctive Features

- Studies at the weekends
- Addressed to practitioners – building their professional career
- Opportunity to consolidate the horizontal knowledge on creating optimum IT systems
- Gain specialist knowledge of great value for the IT sector
- Develops capacity to create IT systems
- Intensive programme for the first two years
- Increase the employee's value on the labour market.
- International character of the studies (studies in English)
- Ability of modelling, synthesising and working as a team over complex issues
- Encourage the business value assessment of the developed solutions and projects
- Support scientific work: challenges of modern technologies

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SWOT Analysis

	Strengths	Weight		Weaknesses	Weight
s_1	Experience in having full-time PhD studies	0.3	w_1	Available scientific resources are overloaded with other task	0.3
s_2	Experience in supervising of PhD thesis	0.3	w_2	Scientific research partially does not correspond to IT sector needs	0.2
s_3	Competences in computer science research	0.2	w_3	Dispersed scientific knowledge on different IT research fields	0.2
s_4	Experience in cooperation with IT sector	0.1	w_4	Inertia and resistance to change	0.2
s_5	Available e-learning system with base functions	0.1	w_5	No specialized distance learning courses	0.1
	Opportunities	**Weight**		**Threads**	**Weight**
o_1	Large number of IT companies in the neighborhood	0.3	t_1	Companies concentrating only on business activities	0.3
o_2	IT Sector specialists seek to gain knowledge on IT architecture and be distinguished by PhD degrees	0.2	t_2	Companies own research groups concentrating on specialized tasks which find cooperation with university inefficient	0.2
o_3	Increasing trends for cooperation between industry and universities	0.2	t_3	Strong research confidentially in IT sector companies	0.2
o_4	Positive attitude towards internationalization of studies	0.2	t_4	Broad study domain (instead more specialization e.g. trustworthy IT systems)	0.2
o_5	Extension of HR cooperation to PhD level	0.1	t_5	Narrow study domain (instead e.g. interdisciplinary studies)	0.1

Non-domain features of PhD Studies Internet investigation

AGH

	Graduation requirement for Admission Bachelor or Masters degree	37132
	IT or similar graduation requirement for Admission	10032
	Admission Exam	4021
	Proficiency in English needed for admission	503123
	Face-to-face presence required	98110
	Online (e-learning) courses	930124
	Foreign students allowed	600416
	Part-time studies mode allowed	9020
	Obligatory number of hours	80213
	Presence of education points (ECTS)	77610
	Studies Specialization options (Tracks)	309102
	Tuition fee	60430
	Access to on-line libraries	900812
	Fixed length of the studies	60133
	PhD thesis fee	90902
	Dissertation proposal as a conditions to open PhD thesis	4012
	Presence of dissertation committee	1273
	PhD thesis is a condition to defend	10234
	PhD thesis public (advertised) defense	40164
	Publications as progress Measures	86900
	Careers perspective defined (?)	66012
	Partnership with industry for research for real projects	4051
	Presence of interdisciplinary levels (coming beyond IT)	2201
	Predefined studies programme (same for all students)	5301

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PhD Courses – 1st Year

	Hours	ECTS	Credits
Core Courses			
Mathematical Foundation for Computer Science	16	1,5	Exam
Infrastructure Architecture	16	1,5	Assessment
Intelligent Systems	16	1,5	Assessment
IT Project Architecture	16	1,5	Exam
Elective Courses			
Elective Courses	78	5	Assessment
Vocational courses			
Intellectual Property Rights	16	1	Assessment
Research Project Management	14	1	Assessment
Additional Activities			
Cooperation with supervisor	10	0	Assessment
Teaching placement	10	2	Assessment
PhD Seminar	32	4	Assessment
Sum	224	19	

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PhD Courses – 2nd Year

	Hours	ECTS	Credits
Core Courses			
Mathematical Foundation for Computer Science	16	1,5	Exam
Infrastructure Architecture	16	1,5	Assessment
Intelligent Systems	16	1,5	Assessment
IT Project Architecture	16	1,5	Exam
Elective Courses			
Elective Courses	78	5	Assessment
Vocational courses			
Prawo własności intelektualnej	16	1	Assessment
Research Project Management	14	1	Assessment
Additional Activities			
Cooperation with supervisor	10	0	Assessment
Teaching placement	10	2	Assessment
PhD Seminar	32	4	Assessment
Sum	224	19	

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PhD Courses – 3rd Year

	Hours	ECTS	Credits
Core Courses	0		
Elective Courses	0		
Vocational Courses			
Economy (or Philosophy)	30	2,5	Exam
English for academics	15	1,5	Exam
Additional Activities			
Cooperation with supervisor	10	0	Assessment
Teaching placement	10	2	Assessment
Sum	65	6	

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Core Courses

- **Theoretical Foundation of Computer Science**
  - Reference SWEBOK (Software Engineering Body of Knowledge - IEEE Computer Society) chapter 13 – Computing Foundations
- **System Design Engineering**
  - Reference SEBoK (Systems Engineering Body of Knowledge Now Available - IEEE Computer Society)
- **Advanced Data Base Systems**
  - Distributed Databases, Distributed Transaction, Consensus Protocols, No SQL, NewSQL, Distribited Data Stores, Distributed Stream Processing, Alternative Data Storage & Model, Data Warehouses, Machine Learning Systems, OLTP/OLAP Hybrids, Crowdsourcing
- **Software Architecture Design**
- **Mathematical Foundation for Computer Science**
  - Reference SWEBOk ((Software Engineering Body of Knowledge - IEEE Computer Society) chapter 14 – Mathematical Foundations
- **Infrastructure Architecture**
- **Intelligent Systems**
- **IT Project Architecture**
  - Reference PMBOK, Scrum, ArchiMate

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Elective Courses - TBD

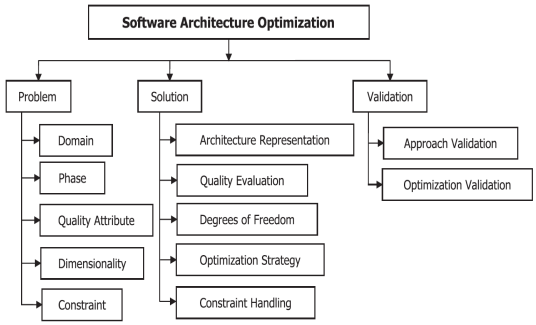
- The studies curriculum will be adapted to the needs of the IT sector and tailored to the needs of course participants.
- It will be modified depending on the current state of development in information technologies and specific needs of the course participants.
- Every year of the course will end with a certificate presenting all the ECTS credits obtained, confirming the acquired competence.

PhD Studies
Resarch Agenda Benefits

- A reference for those undertaking IT research
- Aggregating over the totality of research investigations
- Valuable input to IT- Sector to see potential roles for their contributions
- Facilitate research coordination
- Arrange for articulated academia industry projects
- Define the most effective roles for the large and diverse IT practitioner community, such as engaging business and industry
- Greater potential for theoretical research to organizations whose mission involves prototyping or first application of new ideas
- A community-derived research agenda can serve a cohesive role for future research.
- Researchers will be able to associate their research as it contributes to the larger community agenda.
- The research could be adopted by journals and conferences as index terms.

PhD Studies
Resarch Agenda Possible Example 1

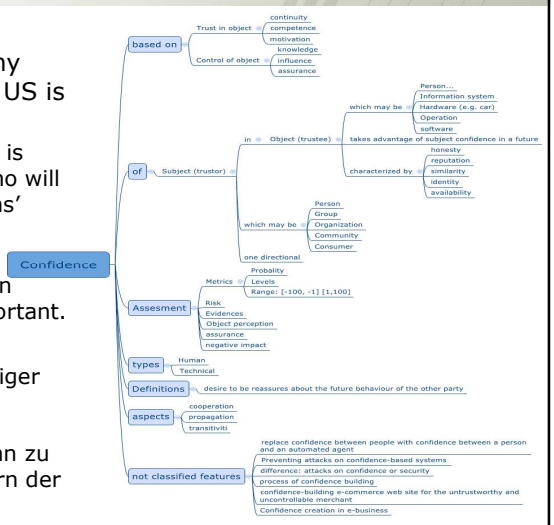
- Software architecture optimization methods
  - to automate the search for an optimal architecture design with respect to a (set of) quality attribute(s)



- [Aldeida Aleti, Barbora Buhnova, Lars Grunske, Anne Koziolek, Indika Meedeniya, Software Architecture Optimization Methods: A Systematic Literature Review. IEEE Transactions on Software Engineering, Vol. 39, NO. 5, 2013, 658-683]

PhD Studies
Resarch Agenda Possible Example 2

- Trustworthy IT Systems
- In [16] the state of trustworthy systems PhD programs in the US is examined.
  - The discussion concerns what is needed to produce leaders who will help protect our cyber systems' health.
  - This example shows that specialization of PhD studies in computer science can be important.
- Niklas Luhmann
  - Als wichtigster deutschsprachiger Vertreter der soziologischen Systemtheorie und der Soziokybernetik zählt Luhmann zu den herausragenden Klassikern der Sozialwissenschaften im 20. Jahrhundert.



Conclusions

- ISAQB condidtions for software architecture courses foundation level for students categories
- ISAQB conditions for internationalizations
- Possibility of ISAQB advanced level alignment to PhD studies should be checked

iSAQB International Software Architecture Qualification Board

Thank you!

- **Questions?**

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