EIC-IAB Meeting Fall 2015 at Penn State University

Modeling Human Resource Management in Information Technology Services Firms

delivered by

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at State College,PA USA on Oct 29,2015

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Modeling Human Resource Management in Information Technology Services Firms

Agenda

- The IT services Growth Scenario
- IT Services Industry characteristics
- Demand Estimation for services
- Role of different factors of production
- HRM as a comprehensive function
- SCM of HRM: Challenges
- The cascading models
- Service Portfolio Optimization
- Recruitment Planning
- Training Management
- Talent Engagement
- Pitfalls

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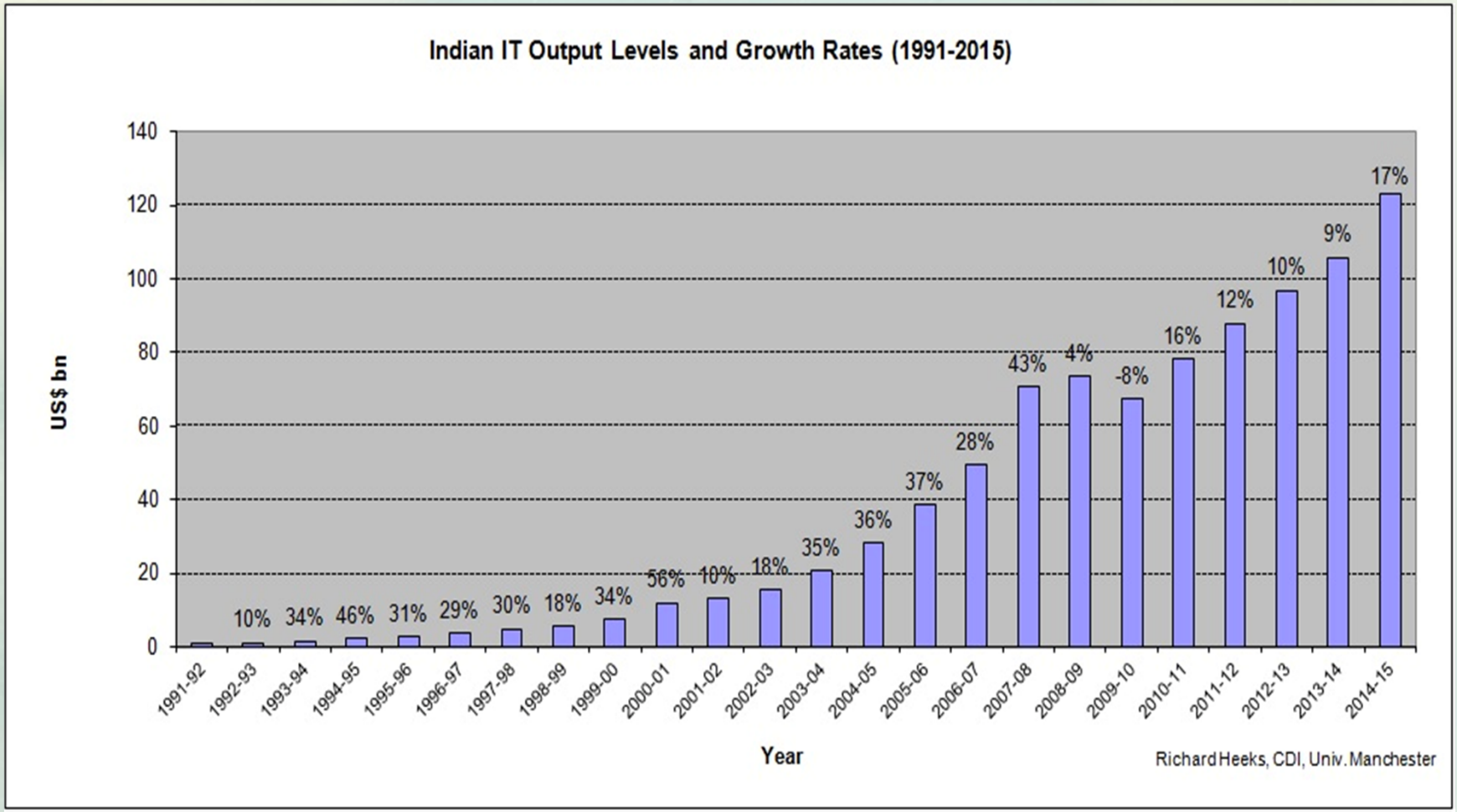
I.T. Services Growth Scenario



It has grown to be a USD 120 B industry by 2015, 80 B coming from exports. Yet it has less than 2% share of the world outsourcing market.

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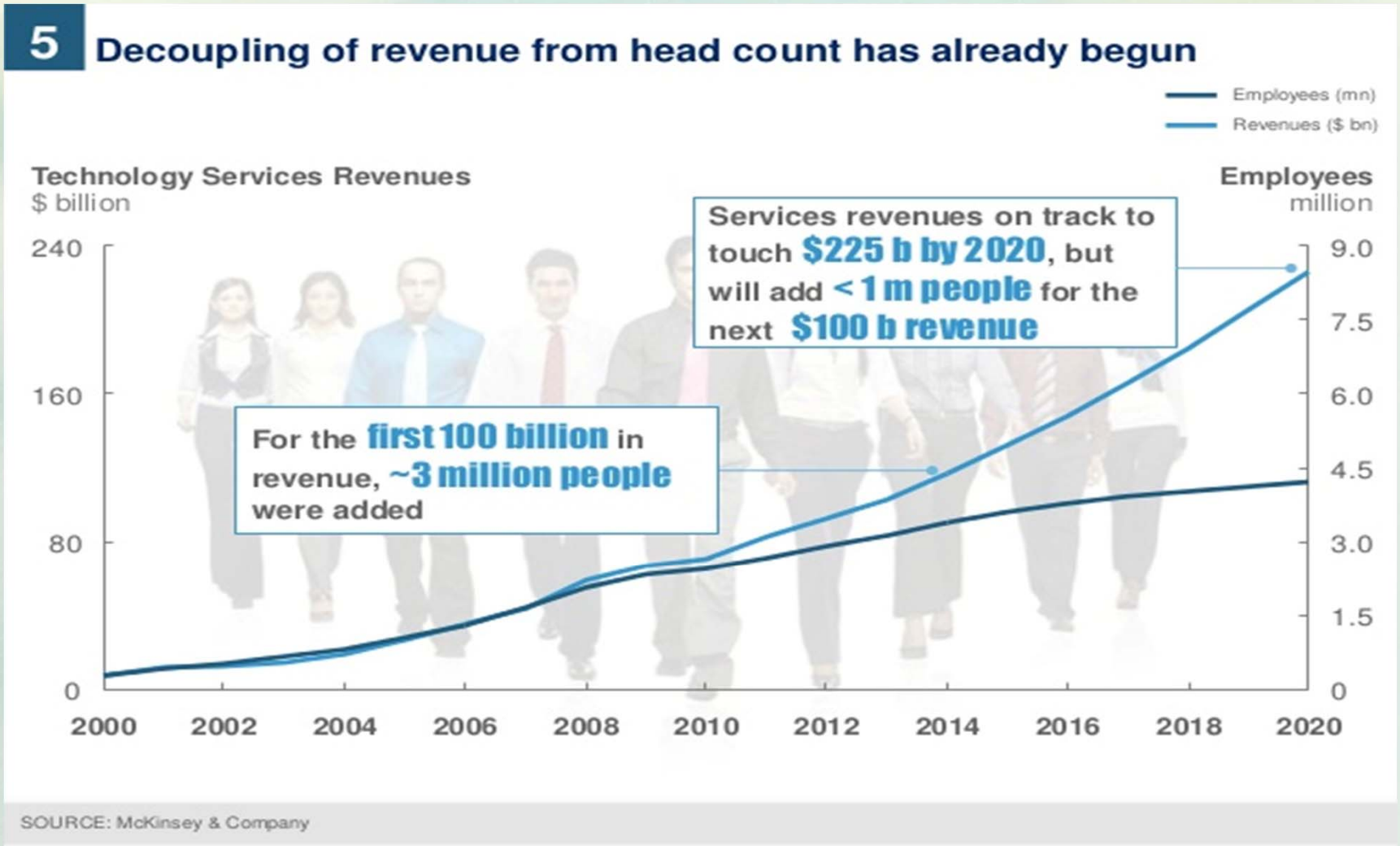
I.T. Services Growth Scenario



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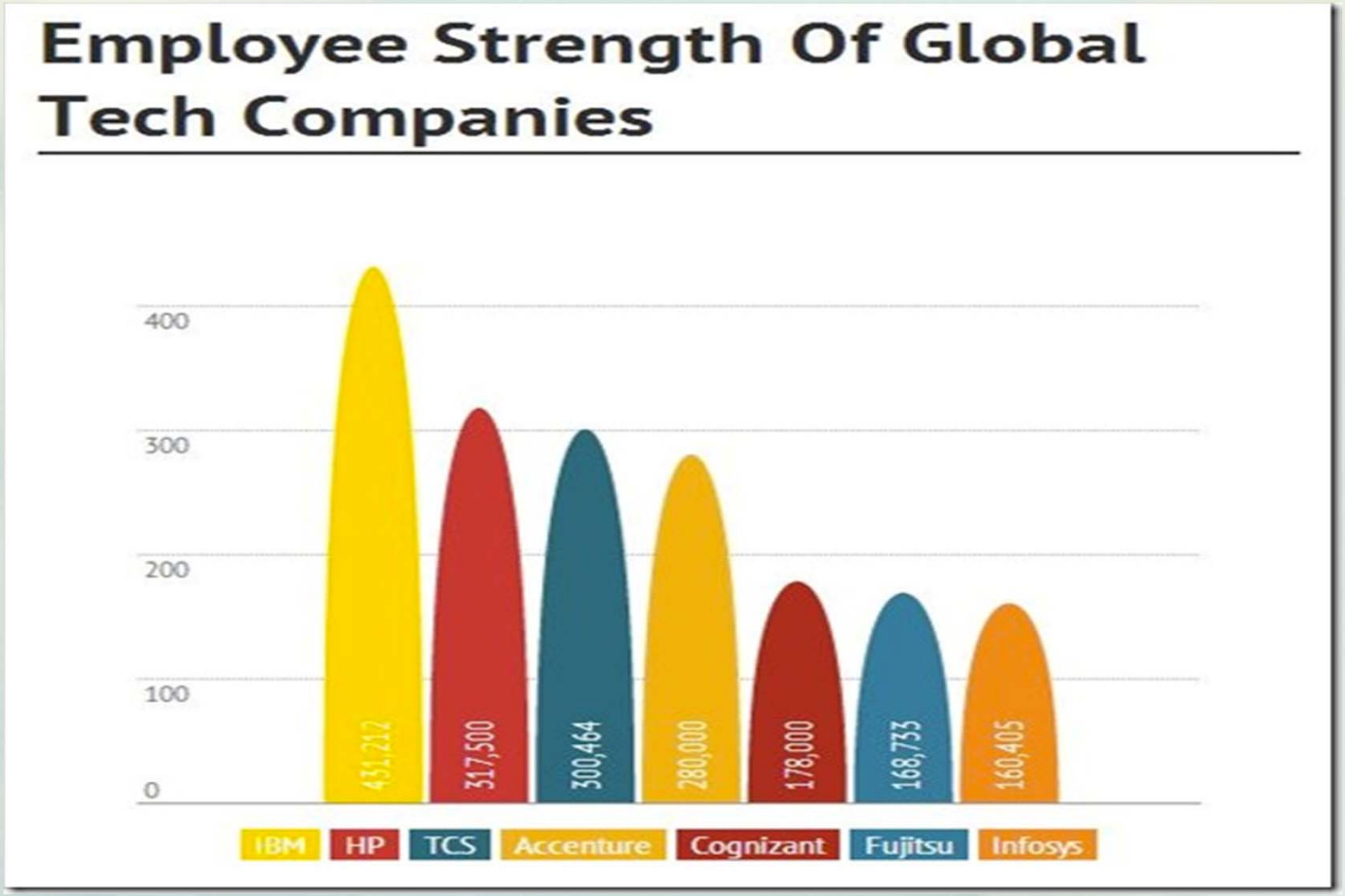
I.T. Services Growth Scenario



Indian I.T. employs more than 3 million people and absorbs 15 % more every year.

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IT Services Industry characteristics

- Modest Investment needed in computers an peripheral devices.
- Spend on consumables is insignificant.
- Not a capital intensive industry but working capital dominates the funding requirement.
- Calls for continuous upgrading of manpower skills.
- Talent Engagement and Motivation are the key management challenges.

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Role of different factors of production

Factors of Production

- Money
- Machinery
- Materials
- Manpower

Manpower as a resource differs from others:
It is self motivated.
It can continue to learn for ever.
Hence its productivity is elastic.
So is its ROI.

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Demand Estimation for Services Vs. Tech Skills

Industry Evolution:

Cost Arbitrage *to* Service Quality *to* Tech Skills and Agility

- Combination of skills demanded
- Languages, New Devices, Tools
- Middleware

Estimating shifts in demand for skill sets in different service offerings, geographies and verticals is a daunting task.

- Industry Trend Reports
- Customer Surveys
- RFP Analysis
- Price Elasticity of Demand

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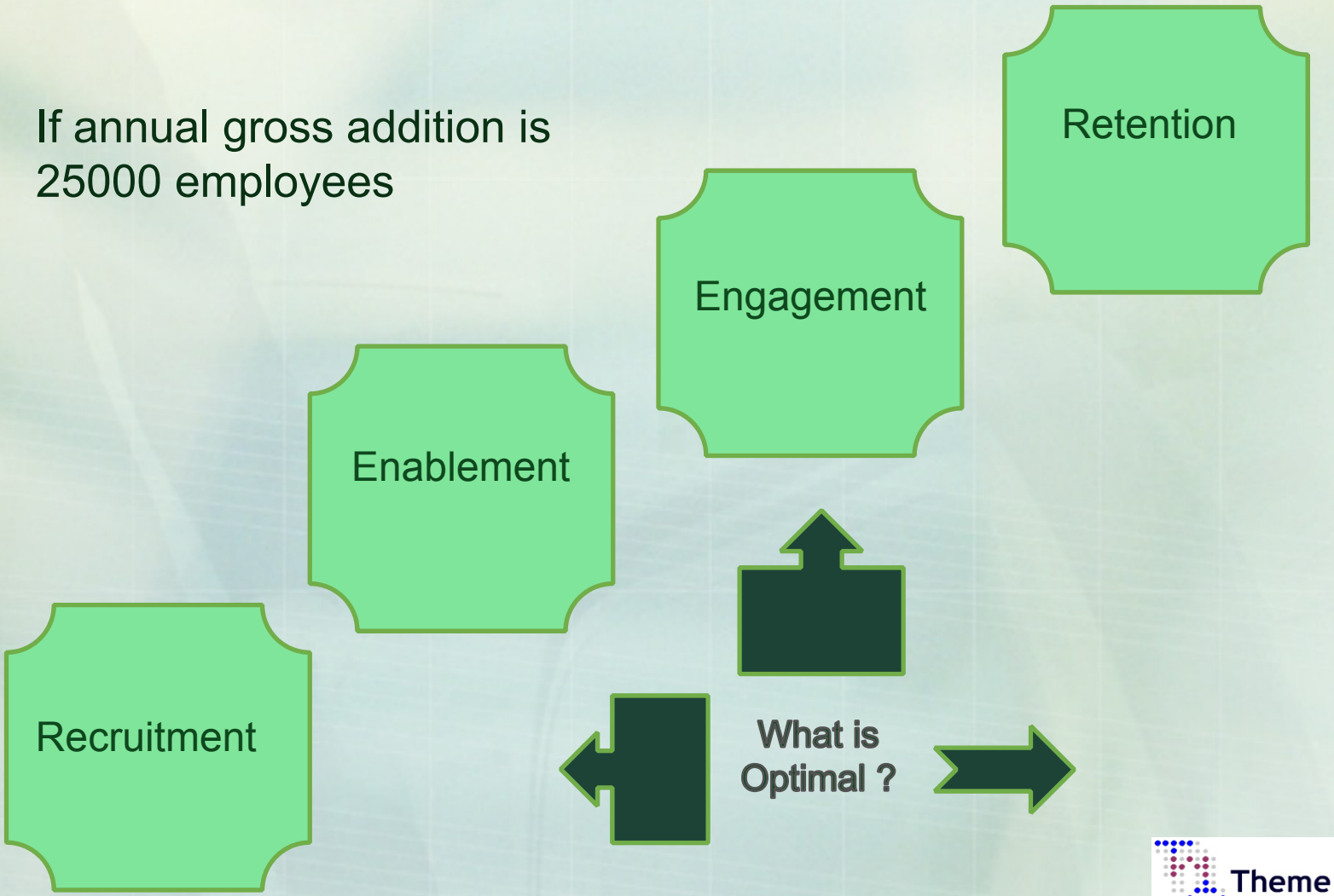
HRM as a comprehensive function

If annual gross addition is 25000 employees



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SCM of HRM

Freshers Recruitment

Training

Team Formation

Purchases

Deployment

Client Engagement

Project Management

Travel Management

Visa Management

Currency Management

Market Recruitment

Bench Staff

Appraisal, promotion & incentives

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SCM of HRM: Challenges

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System Uncertainties

- Service Demand Pattern
- Tech skills Demanded
- Technology Mix of Projects in Ser vice Types
- Demand for Contract Types
- Price Sensitivity
- RFP arrival patterns
- Win Percentage
- Visa lead time, Visa Availability
- Currency, Country Risk

- Training Demand
- Combination of skills
- Bench or Train?
- Attrition Rate
- Salary Sensitivity
- Recruitment Demand
- Freshers Availability
- Freshers Skill Mix

Macro Models do little justice to management of these many uncertainties.

Their alignment with Org structure and DM hierarchy is poor.

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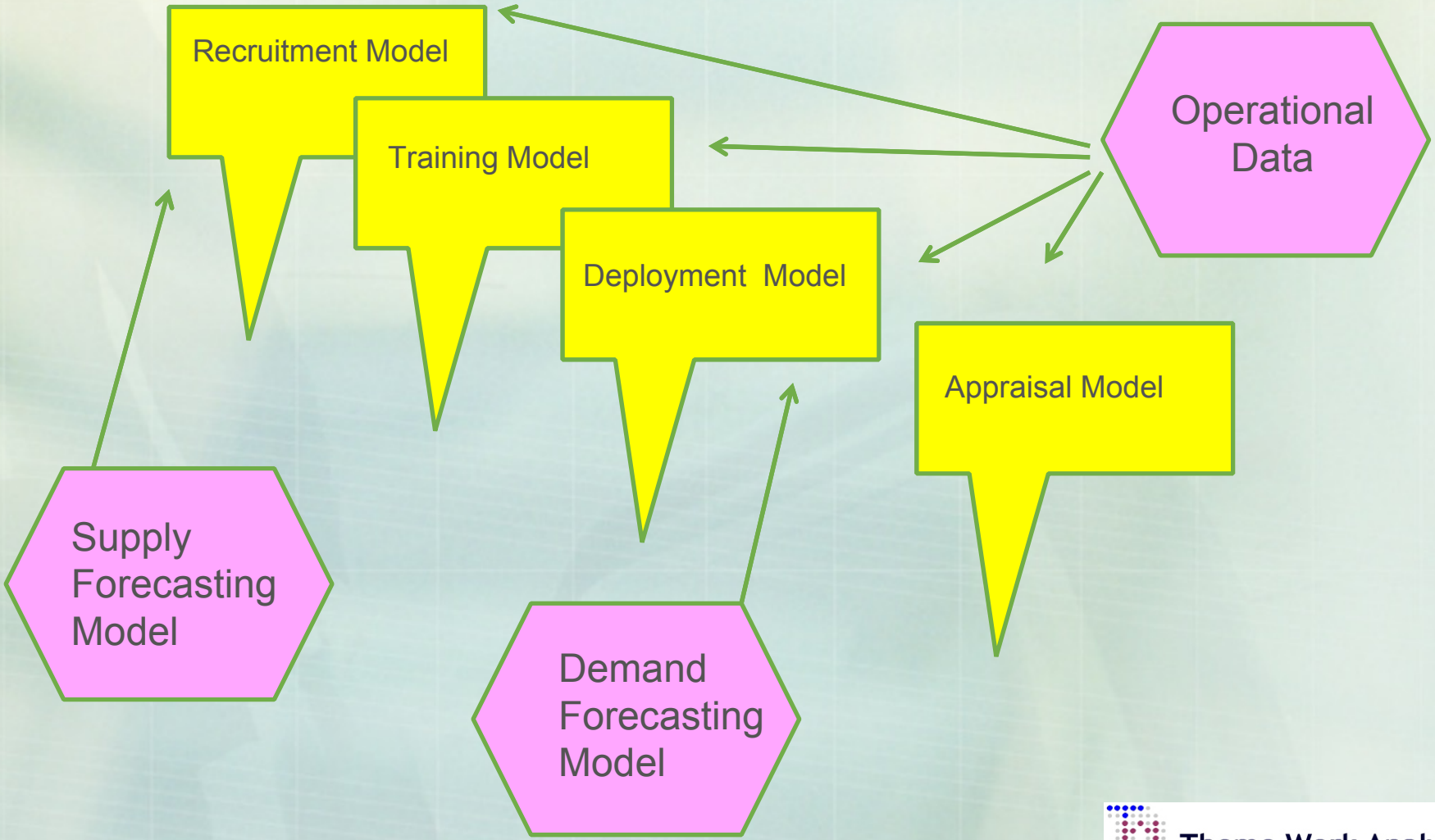
The cascading models



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Service Portfolio Optimization

Objective is to maximize total Gross Margin earned by deploying staff optimally

GM varies based on four major factors

Service Line	Geography	Business Vertical	Business Model
ADM	NA	BFSI	T & M
Consulting	Europe	Manuf	Fixed Price
IMS	APAC	Telecom	Pay Per Use
BPM	MEA	Health Care	Outcome Based
Eng. Services	India	Hospitality	

Planning horizon is two quarters ahead due to demand visibility issues

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- Assume set of service Offerings options **X**={*1,…,X*}
- Option $x \in \mathbf{X}$ defined by important attributes , some examples

- Service Types X_i
  - Development Projects $X_{I=1}$
  - Maintenance Projects $X_{I=2}$
  - Package Implementation $X_{I=3}$
  - System Integration $X_{I=4}$
  - Consulting $X_{I=5}$
  - Testing $X_{I=6}$
- Service Geography X_j
  - Europe $X_{J=1}$
  - APAC $X_{J=2}$
  - NAM $X_{J=3}$
- Service Contract X_k
  - Time & Material $X_{k=1}$
  - Fixed Price $X_{k=2}$
  - Profit Sharing $X_{k=3}$
  - Licenses & Fees $X_{k=4}$
- Industry X_l
  - Financial Services $X_{I=1}$
  - Retail $X_{I=2}$
  - Telecom $X_{I=3}$
  - Manufacturing $X_{I=4}$

- The decision variables ($X_{i, j, k, l}$) are the Number of Resources Deployed in the respective categories.
- The Gross Margin associated with the respective service

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Service Portfolio Optimization

System constraints are many. The key ones are

- Existing Commitment to deliver on projects
- Work Permits, Visa availability in each Geography
- Desire to limit risk from each Business Model
- Staff availability with appropriate technical skills
- Limiting country and currency risks
- Need to maintain bench strength

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The Mathematical Model

maximize $\sum_{l}\sum_{j}\sum_{k}\sum_{l} X_{ijkl} * G_{ljkl}$ Subject to

$0.8*X^{c} . R \leq \sum_{l}\sum_{j}\sum_{k}\sum_{l} X_{ijkl} * G_{ljkl} \geq 1.2*X^{c} . R$

Where X^{c} is the current allocation Vector and R stands for the corresponding per unit revenue vector

$$\sum_{i}\sum_{k}\sum_{l} X_{ijkl} * 0.2 \leq X'_{j}$$

Where X'_{j} represents the number of visas available in country j

Similar equations can be defined to represent country and currency risks or Service Contract risk.

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The Mathematical Model

maximize $\sum_{l}\sum_{j}\sum_{k}\sum_{l} X_{ijkl} * G_{ljkl}$

Let X^T stand for total staff strength during the plan period and let b stand for the desired bench percentage

$$\sum_{l}\sum_{j}\sum_{k}\sum_{l} X_{ijkl} \leq b * X^T$$

And each $X_{ijkl} \geq 0$

Staff Availability with appropriate technical skills is a difficult constraint to incorporate. It requires additional modeling effort to link the Service Types to the tech skills.

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The Mathematical Model

Let $P_{i\,m}$ represent the percentage of staff with specific technology skill m presently deployed in Service Type i

m stands for (1) mainframe skills, (2) Unix & C, (3) Web related, (4) SAP, (5) Oracle etc

Present deployment percentages of skill sets in each Service Type can be assumed to be the applicable pattern for the planning period.

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The Mathematical Model

Then for each m

$$\sum_{i} \left(\sum_{j} \sum_{k} \sum_{l} X_{ijkl} * P_{im} \right) \leq X^{T} * P^{T}_{m}$$

Where X^{T} stands for the max number of staff available for the planning period and P^{T}_{m} represents the desired percentage of total staff with Tech skill m

Multiple runs were performed with a simpler mod el as a Pilot many years ago.

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Modeling based Learnings

- Unconstrained optimization showed the potential to improve Gross Margin by 77 %. It also pushed up the utilization rate to 95%
- To inject reality into modeling the model was constrained to seek solutions within a 20 % range of current solution. Then the GM improvement came down to 20% as well.
- When the GM was kept at a high level without any fall, the team tightened the limits; hence bench percentage went up too. This turns out to be a suboptimal solution.

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Modeling based Learnings

- Linking the Service Type to Tech Skills demanded turned out to be a modeling challenge.
- We felt intuitively that the GM and Utilization Level will both move up when resources are given multi skill sets.
- The best lesson learnt pertains to treatment and handling of uncertainties. Dealing with a sub set of uncertainties in a limited model and then cascading the models in a serial mode enabled much better understanding of the real world and improved impelementability.

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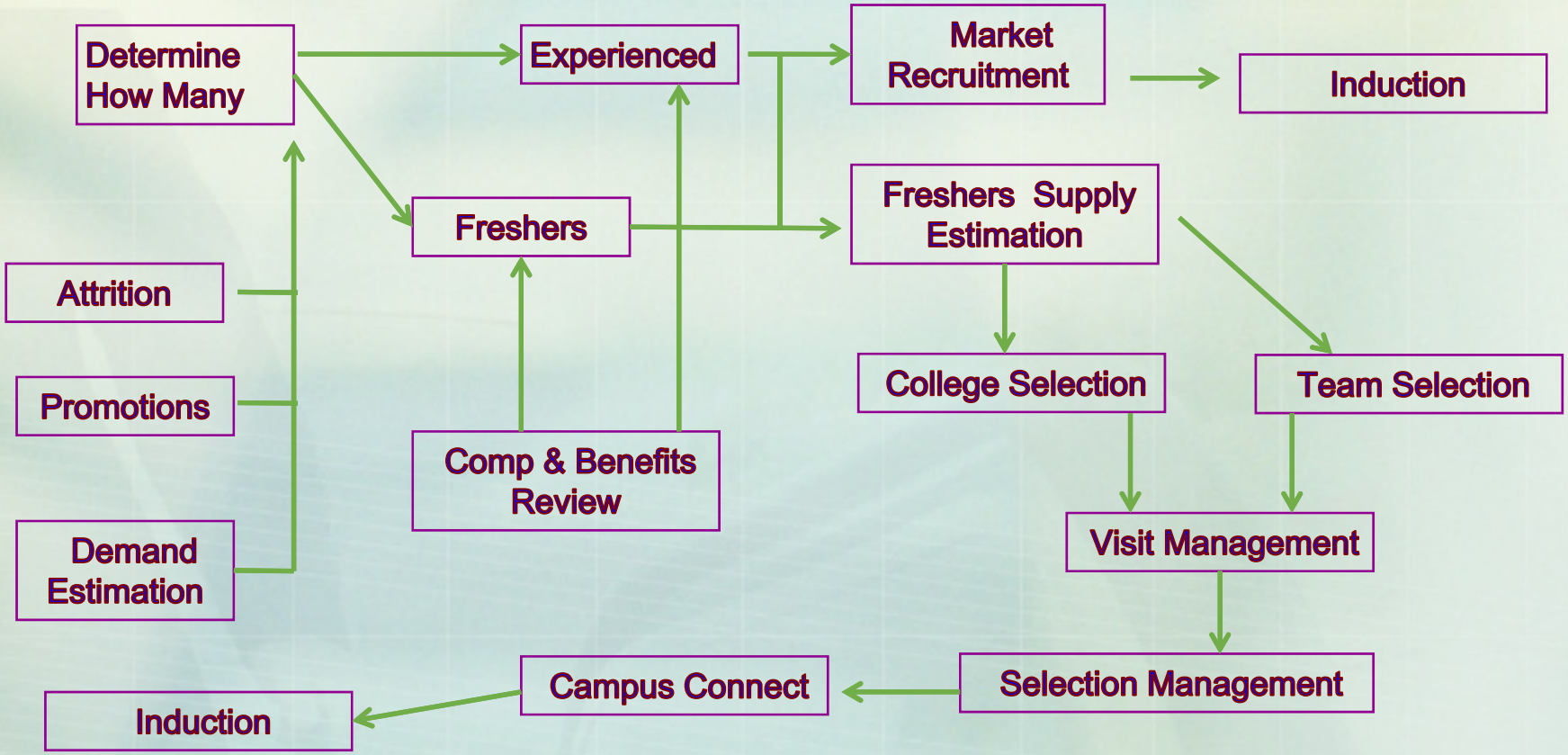
Recruitment Planning



Simulation, Scheduling and Tour Planning routines help to optimize the processes.

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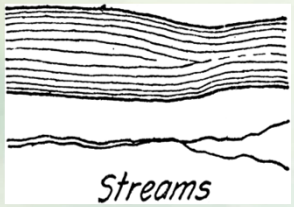
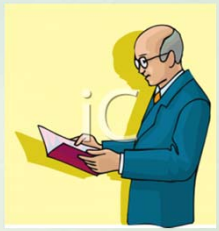
Training Management



Stream Determination

Capacity Building



Trainer Recruitment etc.

Needs Assessment

Training Sessions

Trainee Allocation

Assessment

Completely amenable to mathematical programming

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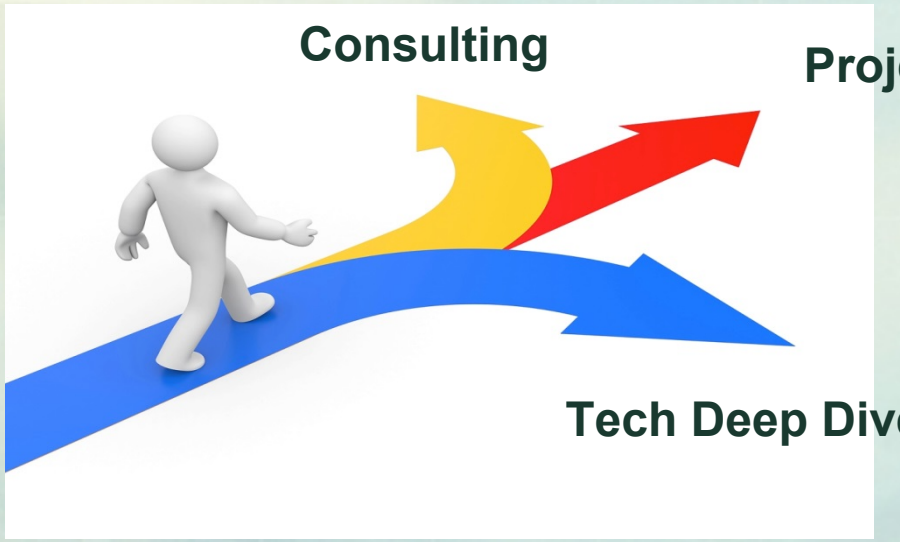
Talent Engagement



Appropriate Career Path

Not amenable to macro modeling but micro s cheduling is possible

Global Work opportunity

Client Market interface

Challenging Assignments

No extended bench stay

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Pitfalls in use of Analytics

- Demand based Firing
- Grading on the Curve
- Resignation Prediction

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