Types and Roles of Systems Engineers

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Summary of research conducted under the auspices of the
Gordon Center for Systems Engineering
at the
Technion I.I.T, Haifa, Israel

Introduction
What is this talk about ?

Placing the right

Systems Engineers

for the

Correct Jobs

at the

Right Time.

Talk Layout

1. Introduction
2. Roles of S.E.
3. Types of S.E.
4. Matching Types to Roles
5. Cases from the past
6. Concluding remarks

Roles of S.E.s

- Include all the **tasks** requiring S.E.s .
- Are program and organization **dependent**. (Example: S.Sheard's list)
- **Change** along the life cycle.

Traditional Project Management Lifecycle

Level of Activity

Initiating Processes

Planning Process

Executing Process

Controlling Processes

Closing Processes

Phase Start

Time

Phase Finish

Figure 1 – Traditional Planning Focus
(Adapted the from PMBOK Guide)

Categories of Roles and Tasks

Category	Emphasis	Examples
I	Results & Goals	Chief S.E., Program Leader,
II	Process & Order	Process Eng., V&V, Requirement S.E.,
III	Methodology & Logic	System Architect, Performance Analysis,
IV	Human relations & Interactions	Customer interface, Program coordinator, Marketing support,
V	Innovation & Creativity	Innovator, Initiator, Problem solver
VI	Special Tasks (Commando roles)	Red Team, Crisis handling, Rival representation.

Talk Layout

1. Introduction
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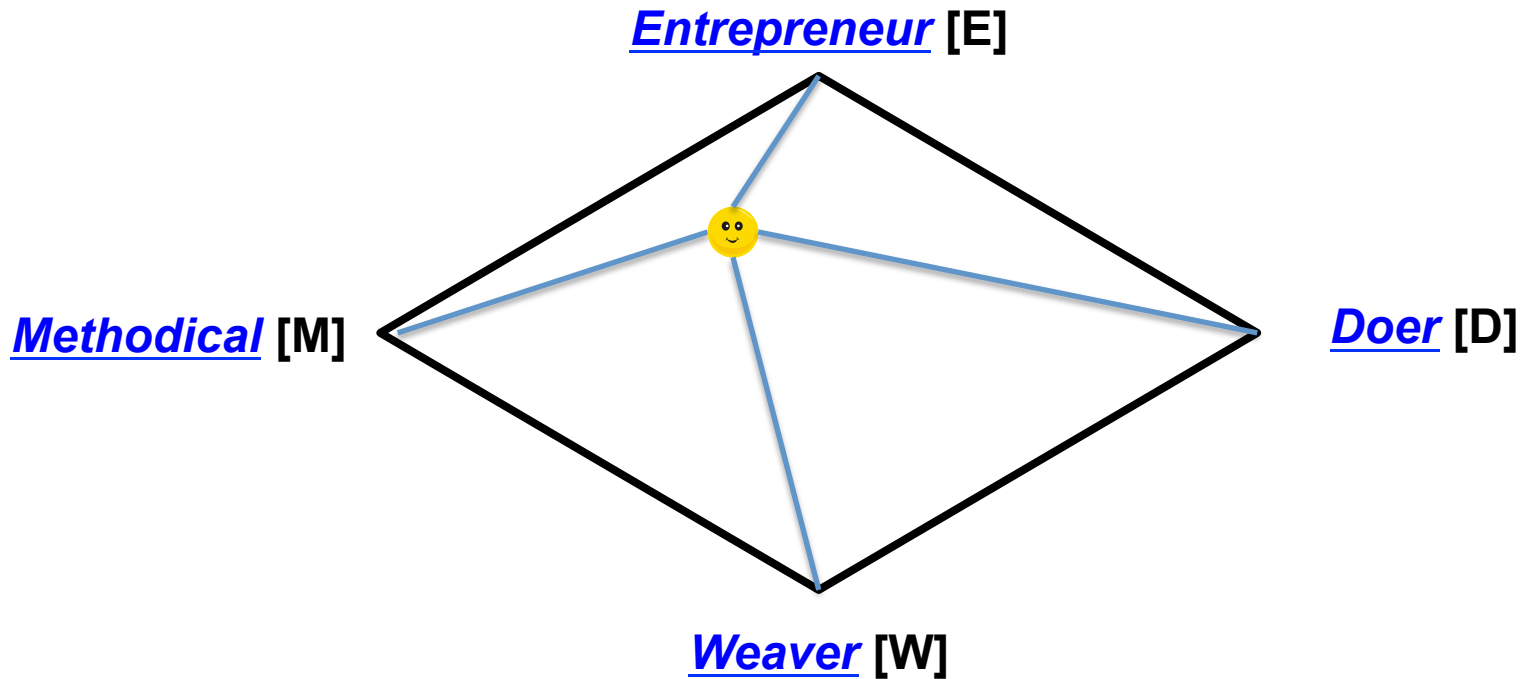5. Cases from the past
6. Concluding remarks

Types of S. E.s

- Defines the **Approach** and **Style** of S.E.s to Systems Engineering.

- Questions:
    - " Is it possible to define types of S.Es?"
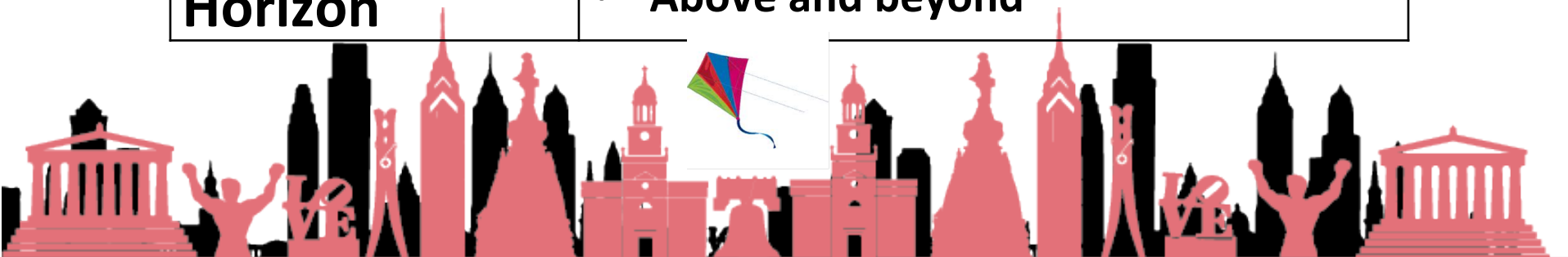   - " How to describe and to identify types of S.Es?"

The Kite Model

Entrepreneur [E]

Methodical [M]

Doer [D]

Weaver [W]

The Entrepreneur [E]

Characteristics	- Continuous curiosity and probing - Constant search 4 needs & problems to be solved - Ingenuity and creativity - Out of the box thinking **Self appointing**
View	• **Novelty** and **Progression**
Focus	• The **Future -** Unsolved needs & problems.
Horizon	• Above and beyond

The Doer [D]

Characteristics	• **Achiever, produces results.** • **Focused and determined** • **Decisive** • **Organizer and motivator**
View	• **Task completion**
Focus	• **The Present - Project and mission goals**
Horizon	• **The next challenge**

The Methodical [M]

Characteristics	• **Systematic and focused** • **Maintains a defined way of thinking** • **Meticulous** • **Aspires flawlessness**
View	1. **Logical and rational** or 2. **Methodical and orderly**
Focus	• **The WAY of doing things.**
Horizon	• **Organizational**

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The Weaver [W]

Characteristics	• Total involvement: Technology, Organization, Business, Social, politics… • Highly communicative, pleasant & patient listener • Agile mind • Charisma & leadership
View	• The **BIG** picture
Focus	• Continuous improvement
Horizon	• Broad and Far.
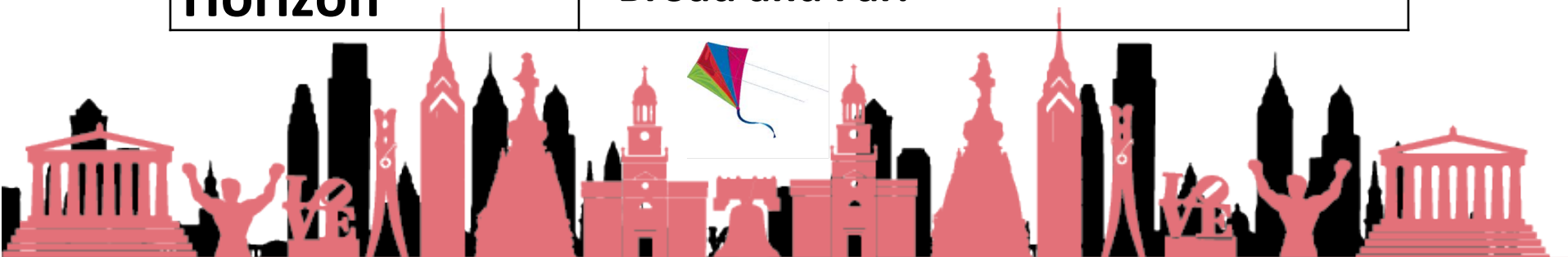
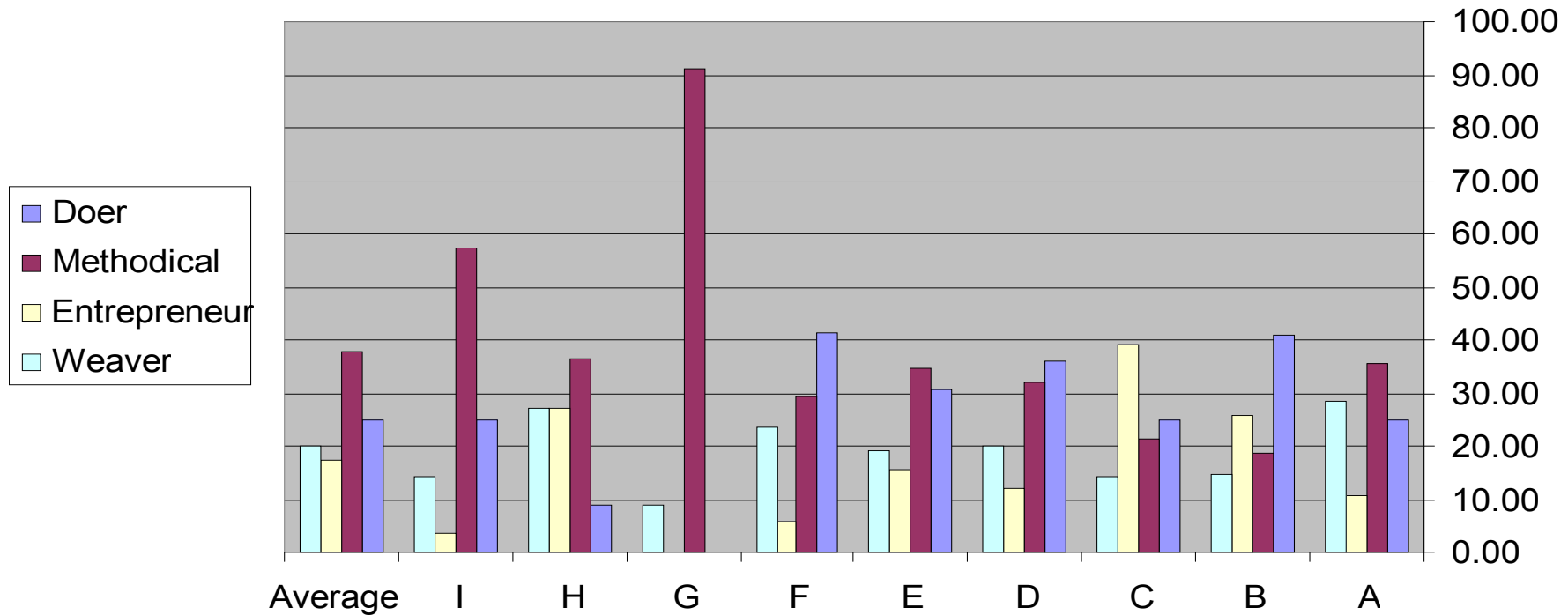# *How to identify S.E. types?*

Self-assessment Questionnaire

Peer review Questionnaire

Unfamiliar S.E.

Familiar S.E communities

Peer review results (%)

Legend:
- Doer
- Methodical
- Entrepreneur
- Weaver

Categories: Average, I, H, G, F, E, D, C, B, A

Talk Layout

Matching S.E. Types to Roles

| Role Category	Emphasis	Recommended Types	Avoid Types
I	Results & Goals	Doer	Entrepreneur
II	Process & Order	Methodical	Entrepreneur
III	Methodology & Logic	**Methodical** secondary **D**oer, **E**ntrepreneur.	
IV	Human relations & Interactions	**Weaver** secondary **D**oer, **E**ntrepreneur.	
V	Innovation & Creativity	Entrepreneur	Methodical
VI	Special Tasks (Commando roles)	Role Dependent	Role Dependent
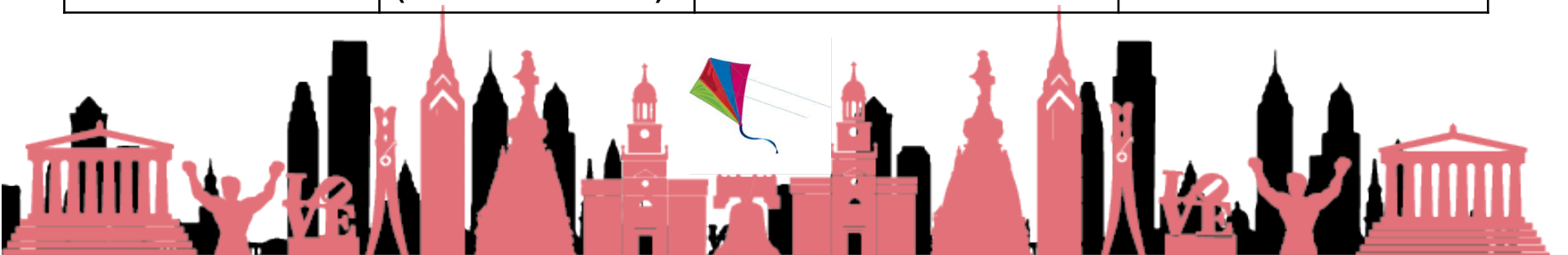
Talk Layout

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Case I: <u>Methodical type leader in Category I Role</u>

- Halted project needed a jumpstart.

- Confident team + knowledgeable client.

- The result: Complexity & price sky rocketed.

- **M**ethodical type – Indecisive & unable to contain situation.

- Replaced by a dominant **D**oer[*] type/

- Brought it to successful conclusion.

[*] – With secondary Methodical and Weaver resemblances.

Case II: **Entrepreneur** *Type followed by a Doer Type*

- **H** an Entrepreneur type initiated a breakthrough product.

- Successful demo - **H** suggested a much improved version.

- Observant manager replaced him by **K** a Doer with secondary Methodical type S.E.

- Project completion was time & cost efficient.

- Replacement was relatively smooth and both **H** and **K** carrier soared.
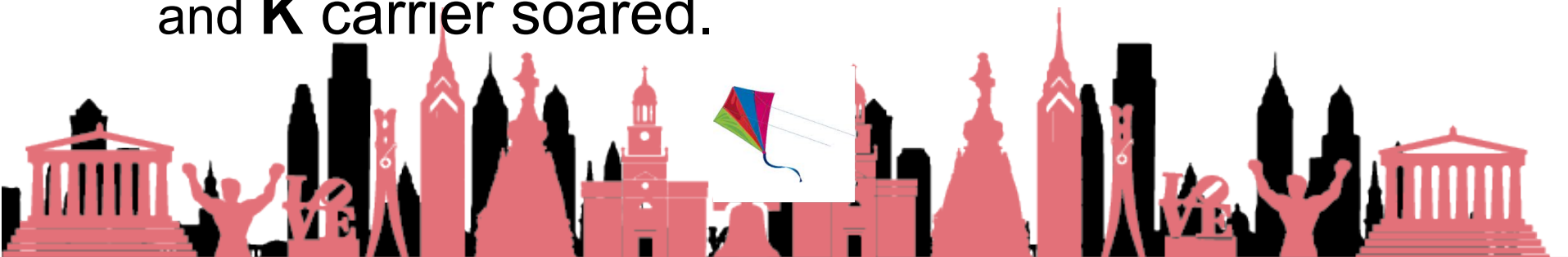
Talk Layout

S.E. Types and Roles Summary

- System Engineering is done by people! Among other traits, it is highly dependent on S.E.'s personality and style.

- Successful System Engineering requires correct and timely matching of S.E. type to Roles.

- A simple tool, The Kite Model, was introduced.

- The Kite Model enables identifying and describing S.E. type profiles.

- A guide to the correct placement of S.E. types to roles by categories, is presented.

- Real life cases demonstrate the importance of correct matching of S.E. types to roles along the life of a program.

THANK YOU

The S.E.'s matching Cookbook

- Define **Needs:**   List of S.E. roles.
- Define **Requirements:** Expertise, S.E. knowhow, and S.E. Type profile.

- Know **your S.E.s:**   Establish your S.E.s Type profile.

- Match **S.E.s to roles:**   Take into account people and life cycle dynamics.

- Be **Proactive:**   Initiate changes when needed.
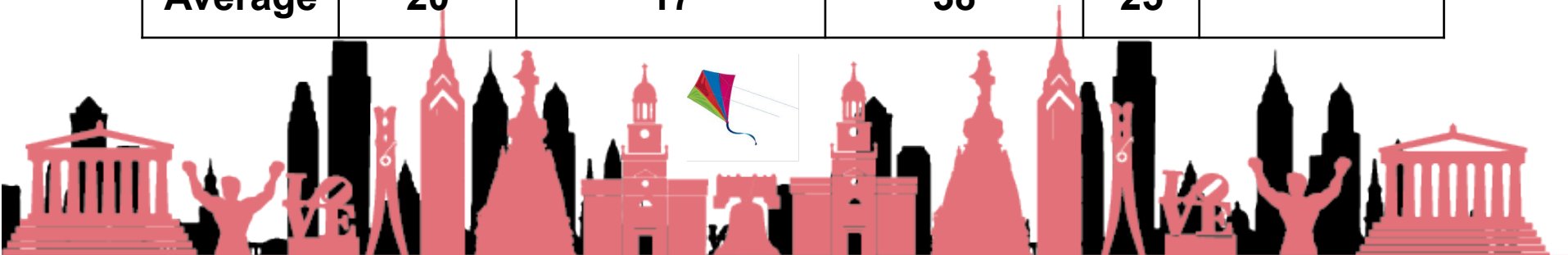
Birth of The Kite Model

- **Accessible –** to managers and S.E.s.
- **Simple** **–** to implement and use.
- **Clear** **–** and non-ambiguous.
- **Objective** **–** independent of use.
- **Acceptable –** By the S.E. community.

Peer review results (%) - Table

Name	Weaver	Entrepreneur	Methodical	Doer	# Reviewers
A	29	11	36	25	8
B	15	26	19	41	9
C	14	39	21	25	10
D	20	12	32	36	8
E	19	15	35	31	7
F	24	6	29	41	5
G	9	0	91	0	6
H	27	27	36	9	2
I	14	4	57	25	9
Average	**20**	**17**	**38**	**25**	

Personal Questionnaire- Example

#	Saying	Behavior Patterns						
1	**The most important thing in performing my work is…**	To advance quickly and practically		To advance in a structured and proven fashion		Find resourceful ways to accomplish The tasks		Work in a coordinated and sync. fashion	
2	**When facing with problems I…**	Rely on proven experience and available tools		Analyze thoroughly relying on proven methods		Look for creative ways to solve the problem		Build a team to tackle the problem	
3	Facing unaccepted difficulty debating how to continue I…	Decide on a direction keeping options for a later correction		Will look for all necessary information before I decide		Rely on my intuition		Looking for solutions and bridge between conflicting approaches	