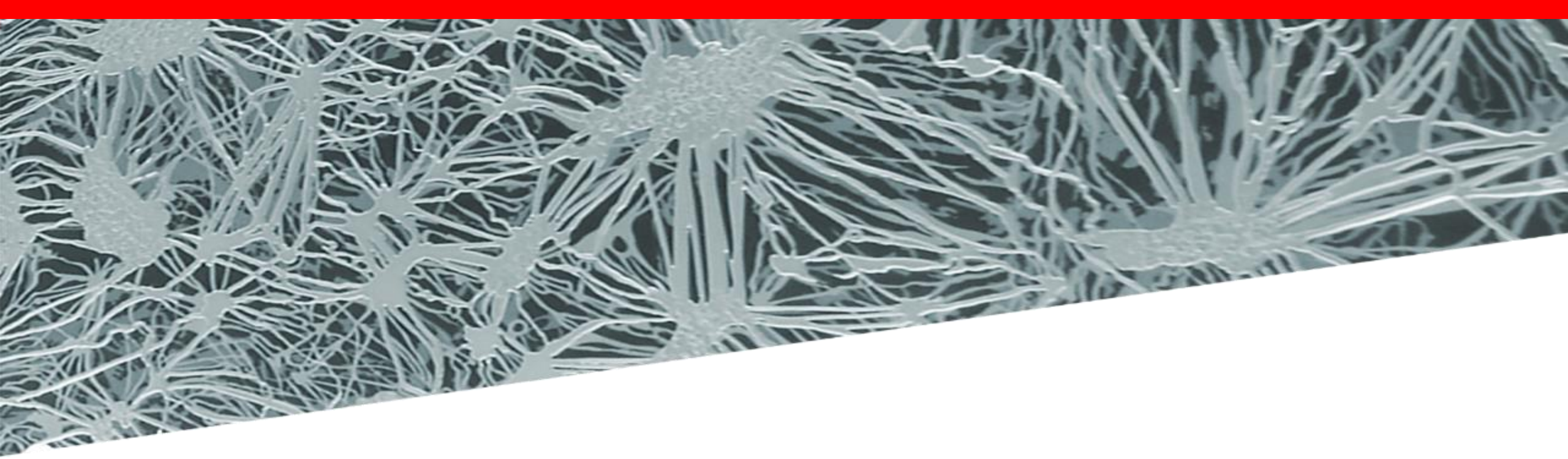
Statistical Engineering Case Study:
Using Networks to Help Determine Associate Contribution at Gore

Willis Jensen – Global Statistics Team Leader



My goal is to tell you a story – so first, some context

A global Enterprise

with a diverse range of products

Privately held company of ~9,500 Associates and more than $3 billion in sales

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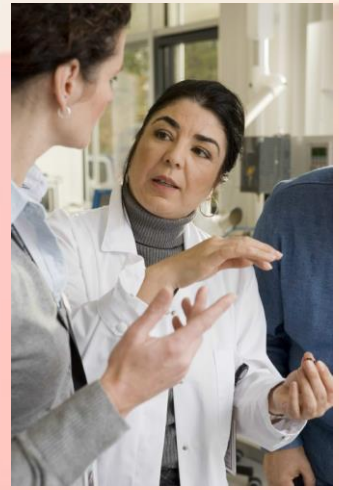
An Enterprise with a Distinct Culture

- Emphasis on personal relationships
- Lattice-based organization
- Minimal bureaucracy
- Environment that encourages innovation and creativity
- Leadership defined by followership



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Key Principle

Contribution = Impact x Effectiveness

Contribution → Compensation

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How We Assess Contribution

Annual process based on input from Associate's peers

Committees rank order Associates based on the peer input and their own knowledge

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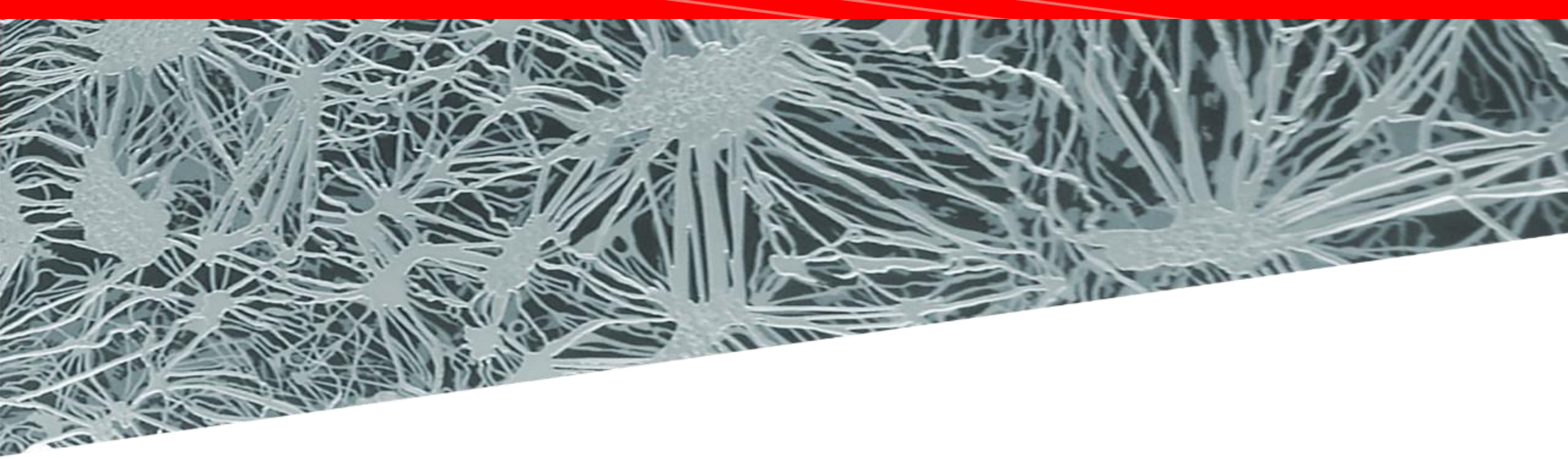

Problem Identification and Strategies

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The Big Problem: How do you efficiently gather input when Associates have many different peers in different functions, regions and divisions?

How Was the Problem Identified?

Informal Associate Feedback: Many Associates noting that the process was very cumbersome and took a lot of time

Leadership Feedback: All leaders on multiple lists and had to do many sets of rankings

Missing Data: Arbitrary grouping by committees leads to many Associates not able to evaluate all in their groups and not providing input

HR Leaders were aware of this feedback and the problem but there had not been any previous efforts to solve it

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How Was This Solved? High Level View

Fall 2015 – "Idea Originator" talked with key HR leader to get support for an idea to solve the problem

Winter 2015 - HR leader got support from Enterprise leadership who recognized that this idea could add a lot of value

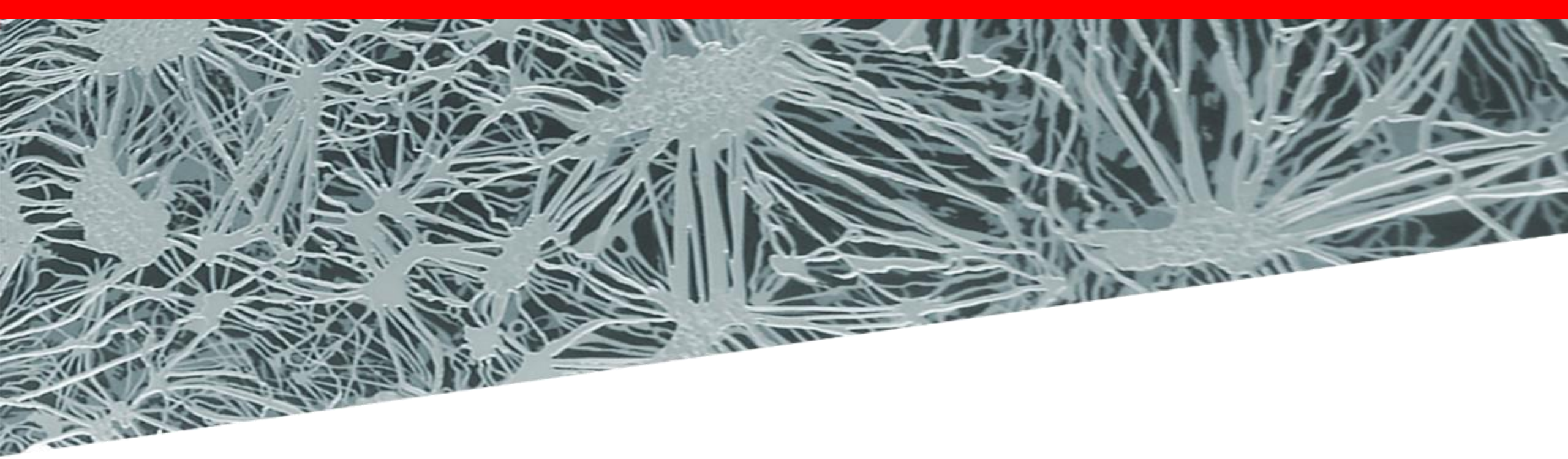
Spring 2016 – Execution of a successful, small prototype experiment involving about 200 Associates to test out solution

Fall 2016 – Leadership approval, project team formed and kickoff to scale up prototype solution for Enterprise

Summer/Fall 2017 – Full scale solution implemented and process successfully executed for the first time

I had informal conversations here and was aware of idea

My real involvement started after the prototype



Cross-Functional Collaboration

The Power of Small Teams . . .

More than 20 Associates involved in the project from many different functions including HR, IT, Statistics, Leadership, Project Management, Change Management and Procurement

Multiple sub teams organized around different tasks within the project

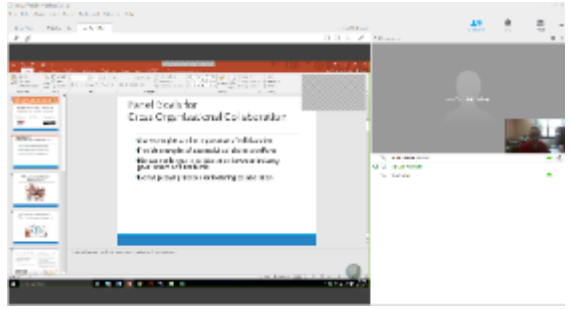
Project Leadership

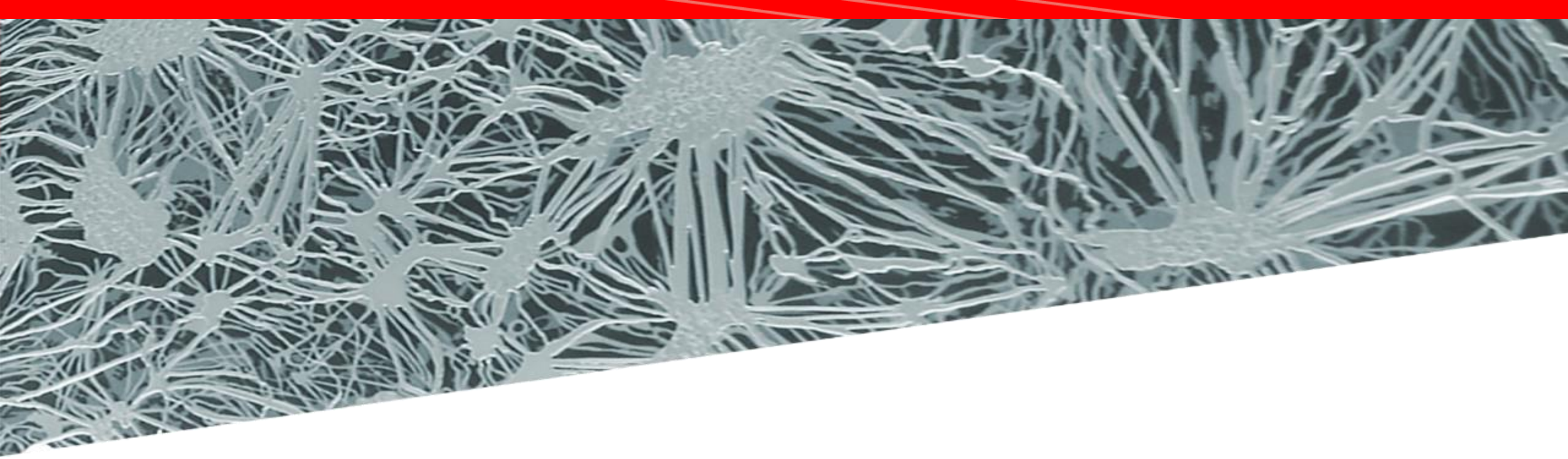
Project champion from HR (the business that owns the problem) with key sponsors in HR and Enterprise leadership

Teamwork

A single face-to-face meeting, majority of interactions were virtual as team members spanned multiple regions and 3 time zones, heavy use of collaboration technology like Webex and Connections

IBM Connections





Tools and Techniques
and
Data/Information Technology

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Reminder

The Big Problem: How do you efficiently gather input when Associates have many different peers in different functions, regions and divisions?

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Problem Part A – Who Should Provide Input?

Solution – Use the Network!

We ask each associate to select 5-20 other associates "who knows their contribution best"

Custom selection of inputters based on who they work with regardless of function, region, division

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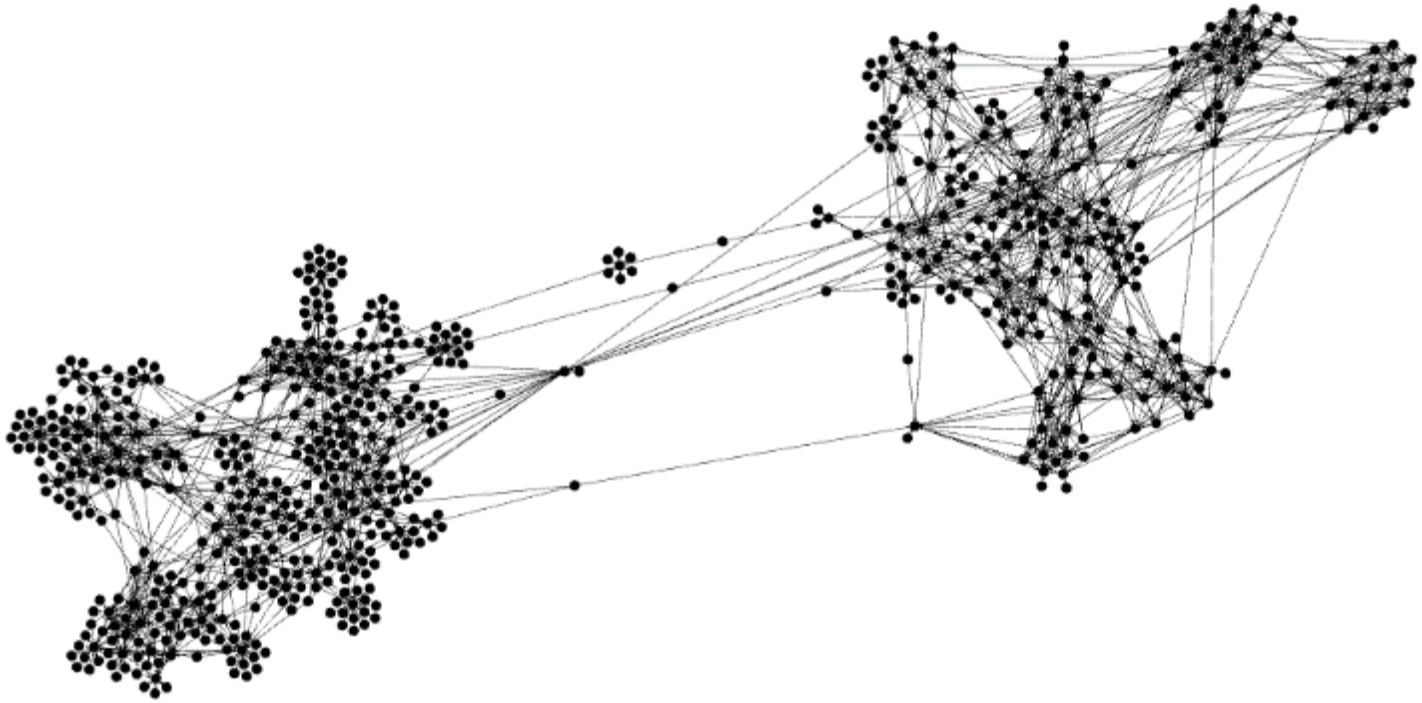
Network Map of the Prototype



Prototype data with about 200 Associates from HR and from Manufacturing Operators (roughly 100 in each group)

Quiz: Can you guess which cluster is HR?

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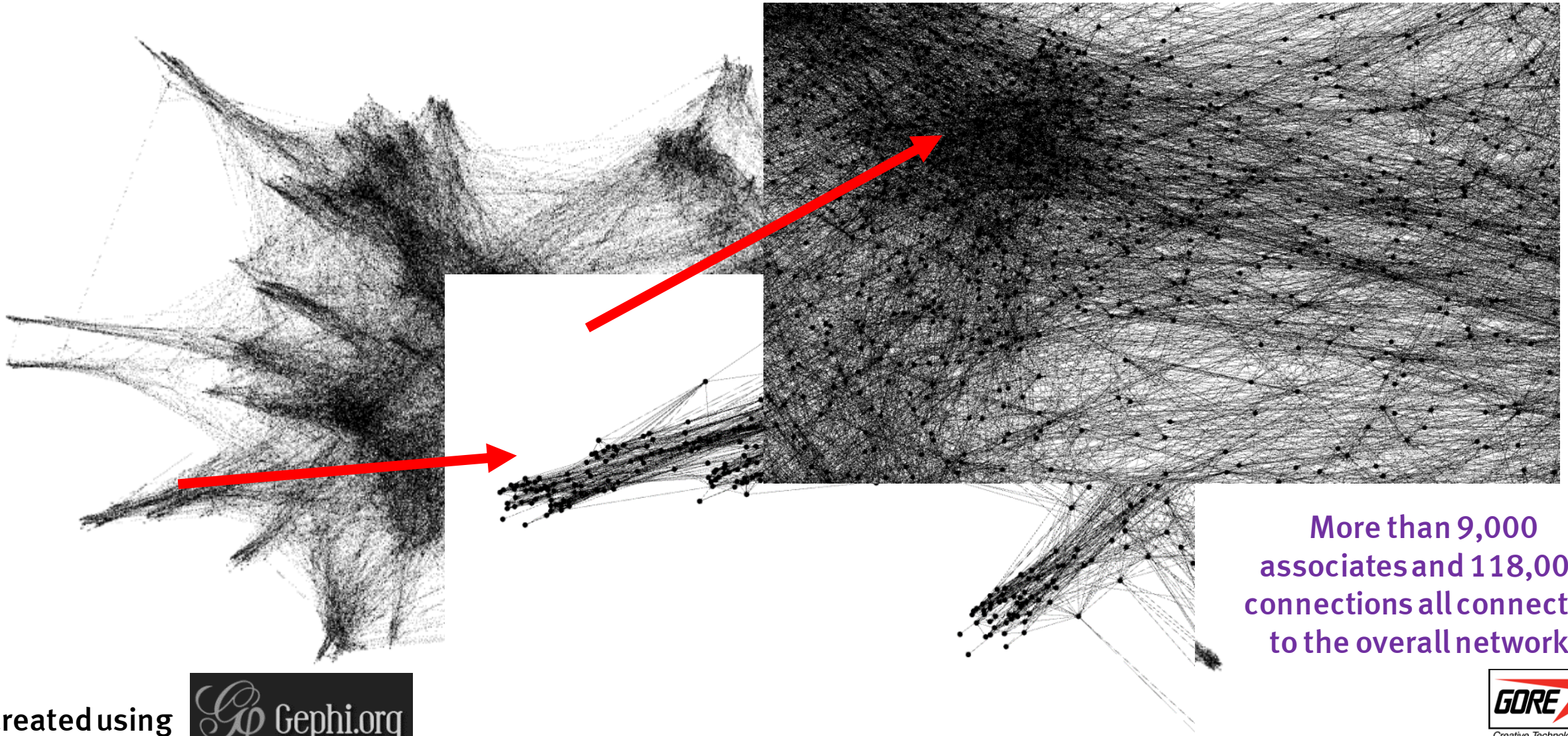
The Full Gore Network Map



More than 9,000 associates and 118,000 connections all connected to the overall network!

Created using Gephi.org

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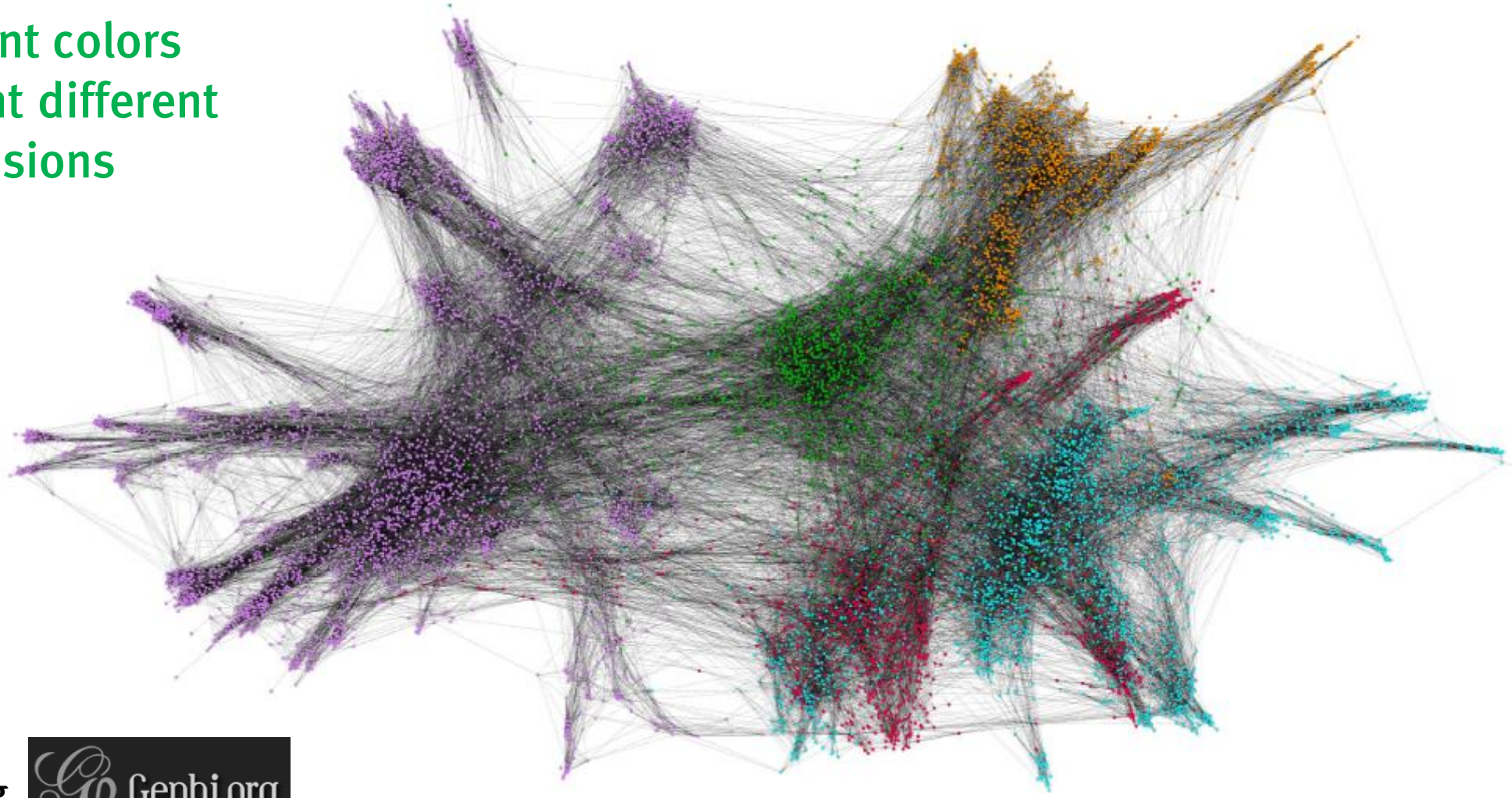
The Full Gore Network Map – Another View

Different colors represent different divisions



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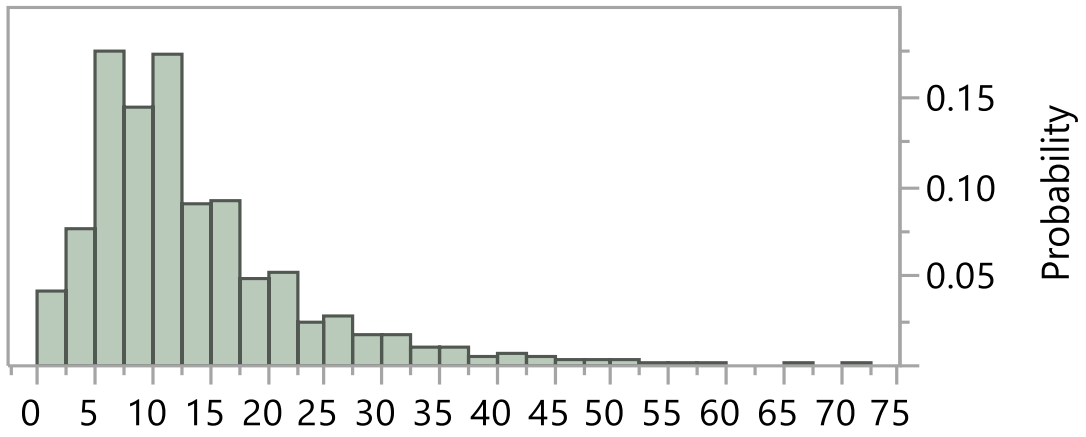
Problem Part B – How to Compare Associates?

Solution – Use Simple Pairwise Comparisons

This creates 2 more questions

1. There is more than a million possible pairs to evaluate, do we really need them all?
2. How do we determine optimal set of pairs to balance “enough data” and “survey fatigue”?

Distribution of Number of Times Inputters Were Selected



Quantiles		
100.0%	maximum	72
99.5%		47
97.5%		35
90.0%		24
75.0%	quartile	16
50.0%	median	11
25.0%	quartile	7
10.0%		4
2.5%		2
0.5%		1
0.0%	minimum	1

Summary Statistics	
Mean	12.698518
Std Dev	8.5681397
Std Err Mean	0.0887807
Upper 95% Mean	12.872548
Lower 95% Mean	12.524489
N	9314

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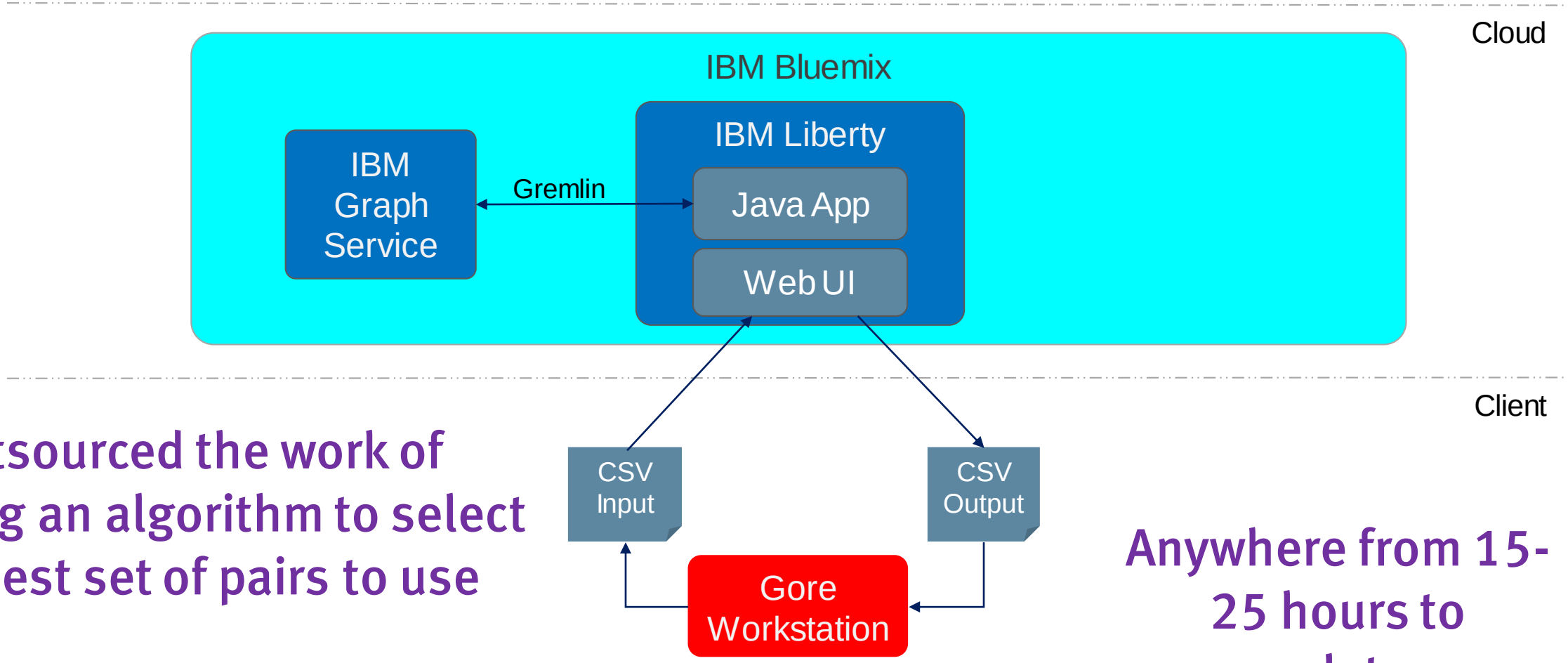
Problem Part C – Which Pairs to Use?
Solution – "The Algorithm"



Outsourced the work of building an algorithm to select the best set of pairs to use

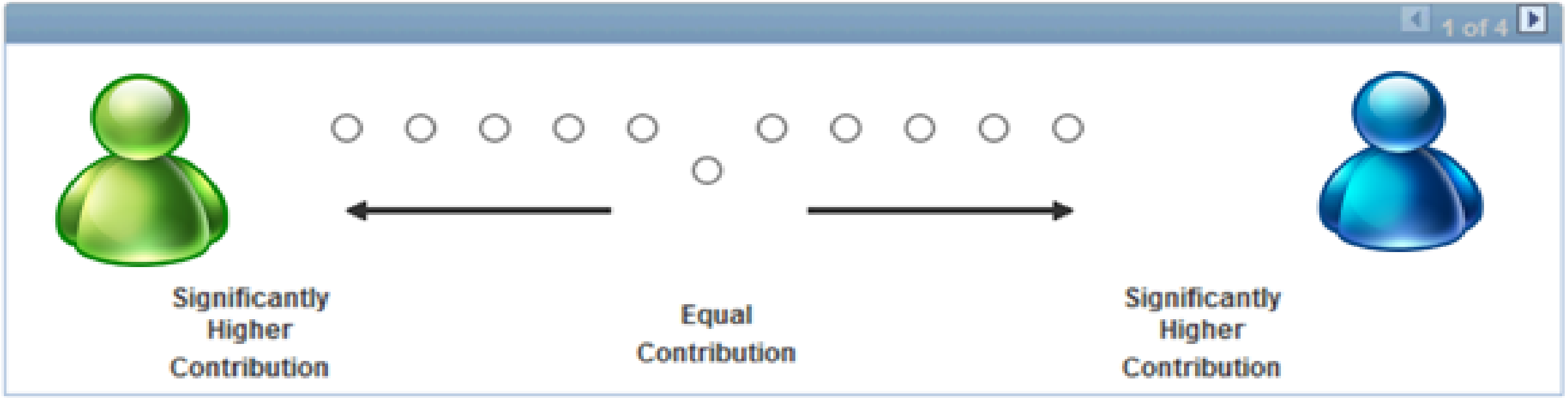
Essentially a really complex optimal design problem

Anywhere from 15-25 hours to complete an algorithm run

Data Collection

Algorithm generates the set of pairs of Associates that need to be evaluated

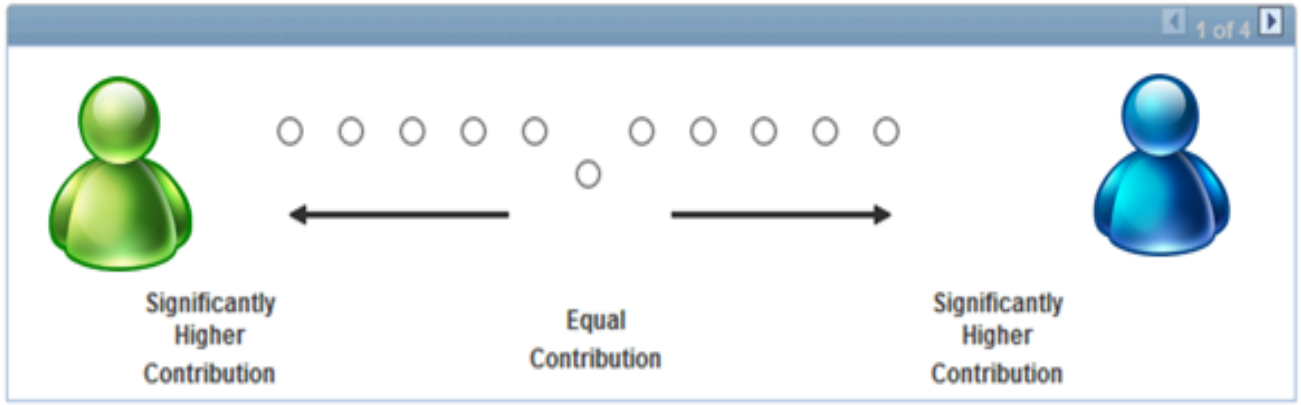
Head to head comparison data gathered via web browser tool



Data Format

Comparisons translated to numeric scores on -5 to +5 scale

-5 0 5



LeftID RightID

inputter_ID	leftID	rightID	value
5533	7919	6009	0
2696	5012	4113	0
2042	4890	8372	0
6168	724	6081	-3
1586	8294	1396	2
6288	8179	765	5
6440	4702	9008	-1
7004	9285	3900	1
9115	6550	4483	1
1483	2080	70	0
9238	5238	6451	0
5589	9608	9708	-1
9112	3324	771	3
7061	4161	9360	0
6870	8286	5195	2

Raw data obtained as an export (large file) from the IT system that was used to collect the data from Associates

More than 280,000 selected pairs that maintain network connectivity

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Data Analysis

Because of its large size, data analyzed using Proc HPMIXED in SAS (60 minute run time)

ID	Rank	Score
83	1	1.000
259	2	1.125
181	3	1.174
27	4	1.204
36	5	1.215
63	6	1.291
231	7	1.319
93	8	1.322
281	9	1.327
163	10	1.338
106	11	1.345
142	12	1.361
477	13	1.366
89	14	1.393
85	15	1.394

2-way ANOVA (Left vs Right position) with 9,000+ levels to get estimates of LS means for each individual

Sorted sum of LS means gives the score that results in rank order

(scaled so that top rank has score = 1)

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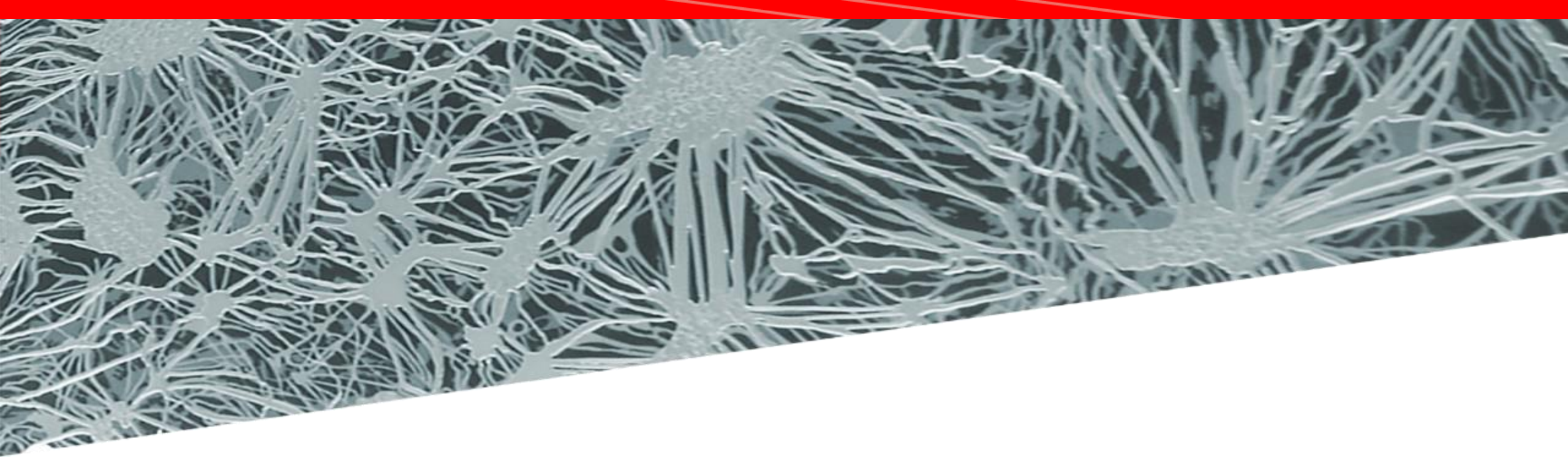

Implementation and Impact

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Process Implementation

Extensive project and change management because of effect on nearly 10,000 associates

Many modes of communication, repeated in many different forms

FAQ

BRAINSHARK

Regional Ambassadors

GORE Intranet

Project Impact

Benefits

- Large reduction in time to provide input - conservative estimate of 10,000 labor hours saved on an annual basis
- Confidence that right input is being gathered that increases trust in the process

Survey results used to assess impact

- 78% of survey users experienced a time savings in the input process (others said similar amount of time)

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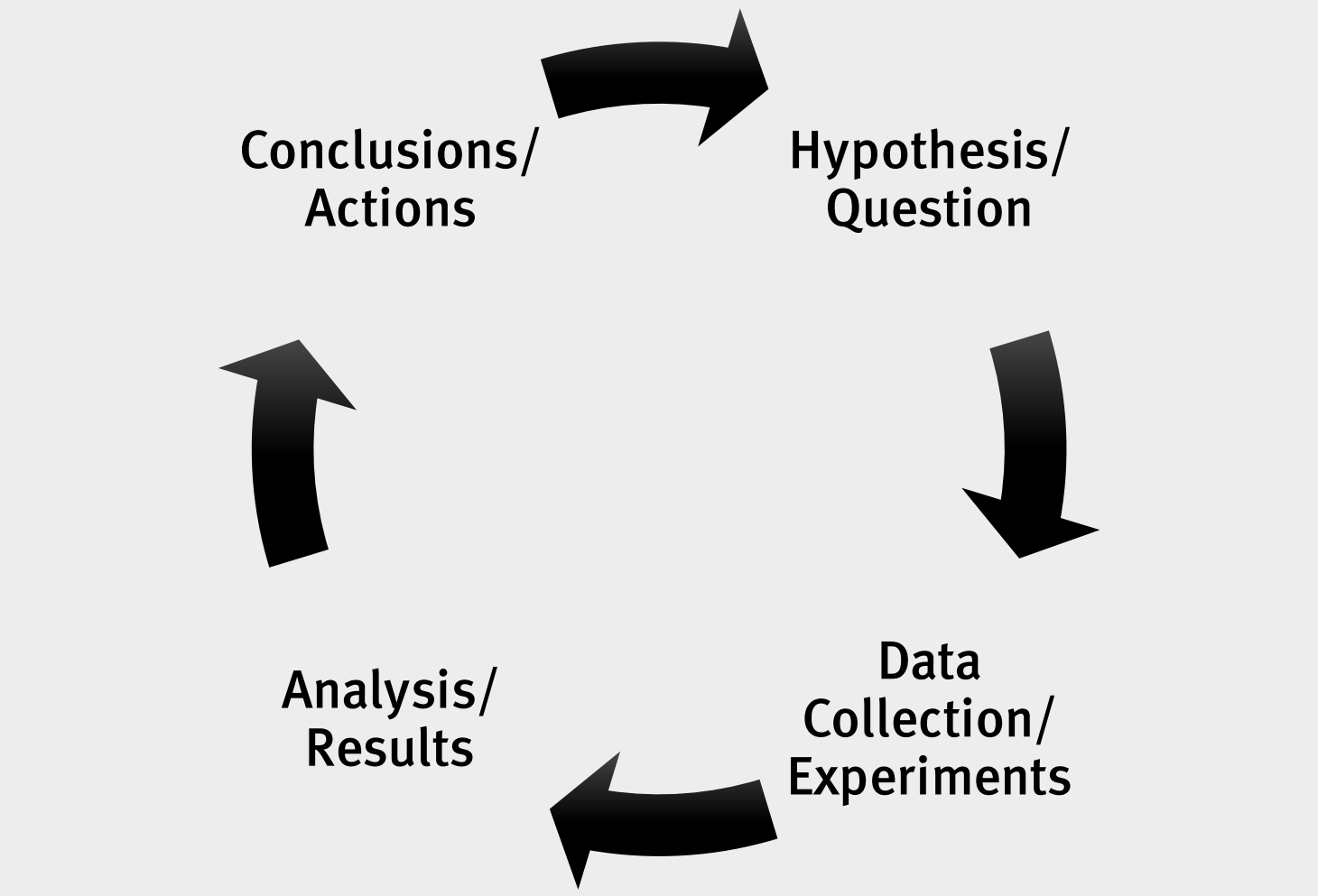
Project Impact – Future Work

Network data generated many more questions that we want to explore and answer

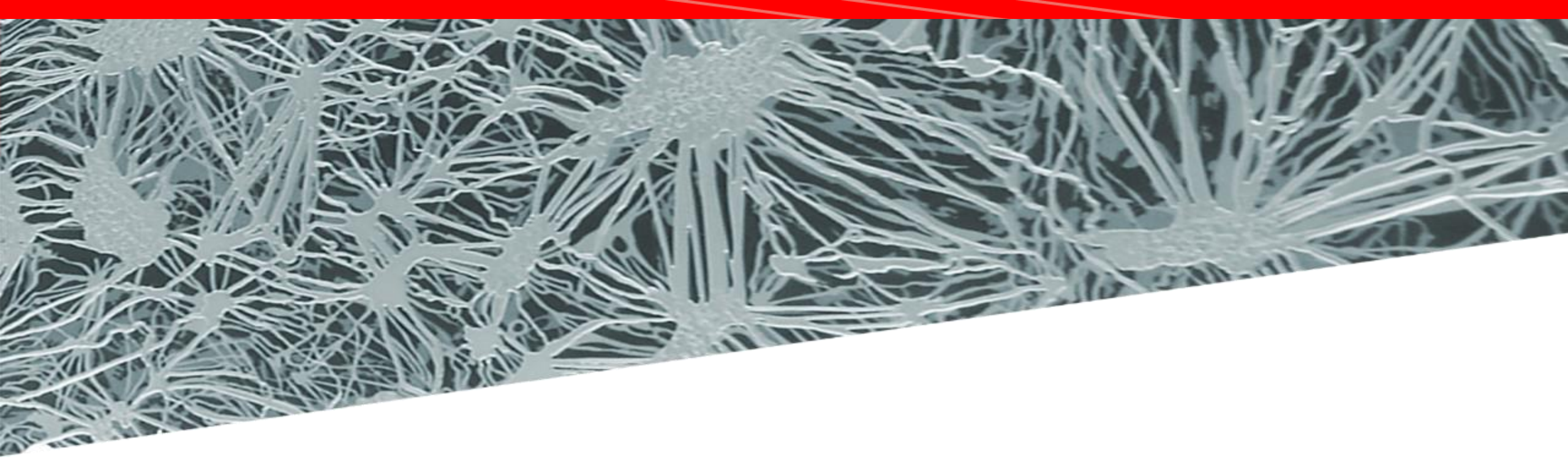
For example - What is the relationship between network metrics and individual effectiveness?

Iteration in the Scientific Method



Maintaining the Gains

Core Team of 6 individuals owning the process going forward (including a statistician) which ensures continuous improvement



Overall Thoughts

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Project Success Factors

1. Clear linkage between the data and the problem to be solved
2. Integrate analytics(statistics) expertise into the project team
3. Provide dedicated IT support
4. Team committed and empowered to overcome obstacles
5. High quality of project leadership and change management effort

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Thank you!