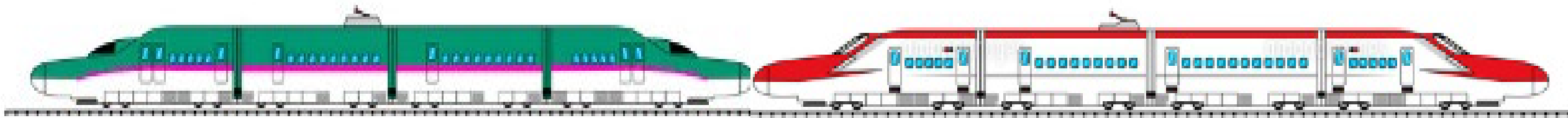


# Measures to Manage Human Error to Complement Technological Innovations such as Big Data, AI, and IoT by Open Innovation



The Morioka Shinkansen  
Transportation Ward, JREU

# About the Morioka Shinkansen Transportation Ward

87 Train Drivers 63 Conductors

25 Office Workers Total 175

Passenger Lines:

**Tohoku-Shinkansen**

Tokyo ~ Shin-Aomori (674.9 km)

**Akita-Shinkansen**

Morioka ~ Akita (127.3 km)

Models



E2 series  
Max 275km/h



E5 series  
Max 320km/h



E6 series  
Max 320km/h

## 2. About the Shinkansen operation

The Shinkansen refers to a train that travels at a high speed of 200km/hour or faster, and its track uses a high-speed dedicated viaduct to enable high speed operation. Therefore, it is more punctual than regular trains and superior in terms of safety.



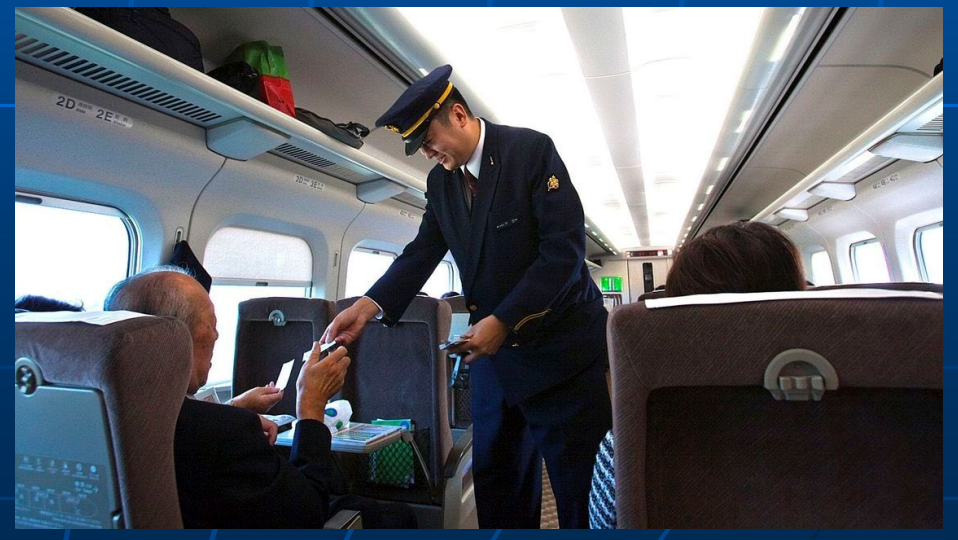
## 2. About the Shinkansen operation

The main task of the Shinkansen drivers is to calculate speed from distance to the next station and the time for scheduled operation. Through daily experiences and regular training, drivers polish their skills to back up the system in times of abnormal situations and to repair vehicle failures.



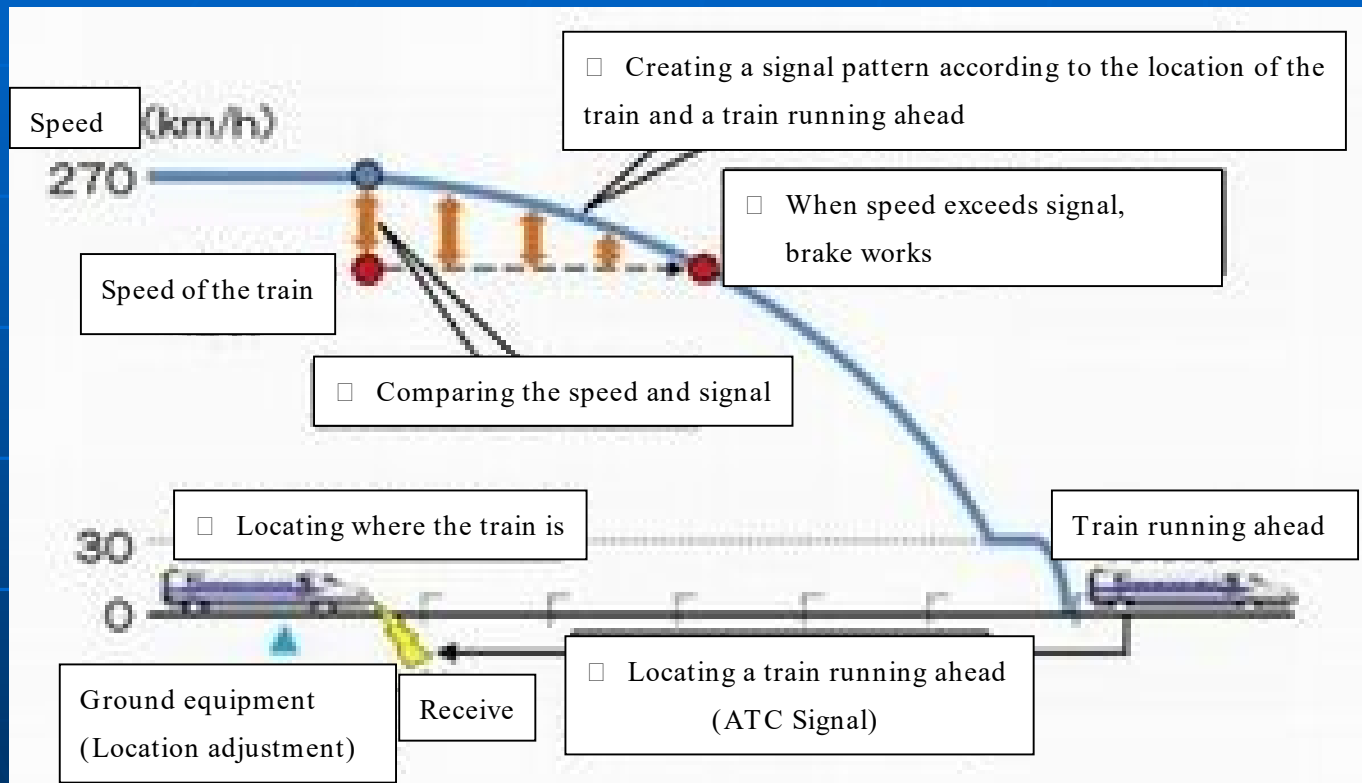
## 2. About the Shinkansen operation

Conductors onboard assist in making sure that passengers travelling to their destinations safely and comfortably. In case of in-vehicle troubles or abnormal situations, they support the passengers while handling the vehicle problems. They are trained to view the situation and to make judgements based on their daily work experience and training.



# 3. Differences b/w the Shinkansen operation and other trains

Because the Shinkansen runs on a dedicated viaduct for high-speed driving, with no level crossings and no entry of people or cars, the drivers are not obligated to look ahead all of the time. The driver needs to look ahead when the train enters and leaves the station. The Shinkansen system uses a signal-safety device called Automatic Train Control (ATC). Because of the special characteristics concerning high-speed running, ATC automatically controls the operating speed of the train according to the distance to the train running ahead and the route.



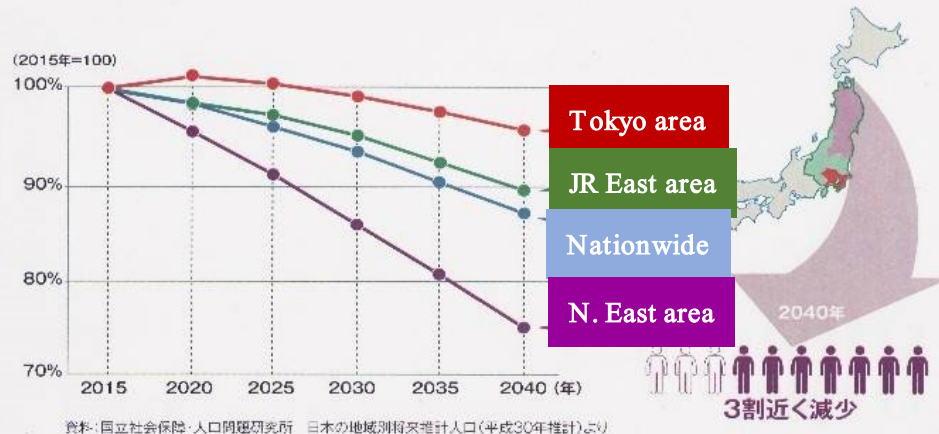
ATC (automatic train control device)

# 4. What are the Japan's innovation and the goal of the Company's crew reform?

The Company has proposed to divert corporate resources from the railway business to the life service business while decreasing its labor population based on the aging population problem. The Company also envisages automatic operation of the railway using driverless system.

## 4. Change about management environment (Declining Population)

- 東京圏(東京、埼玉、千葉、神奈川)は、2025年以降、緩やかに人口が減少していく見込みである。
- 東北地方(青森、岩手、宮城、秋田、山形、福島)では、2040年までに3割近く人口減少が見込まれる。



Future population ratio of JR East business area

## Introducing new models



Next Generation Shinkansen

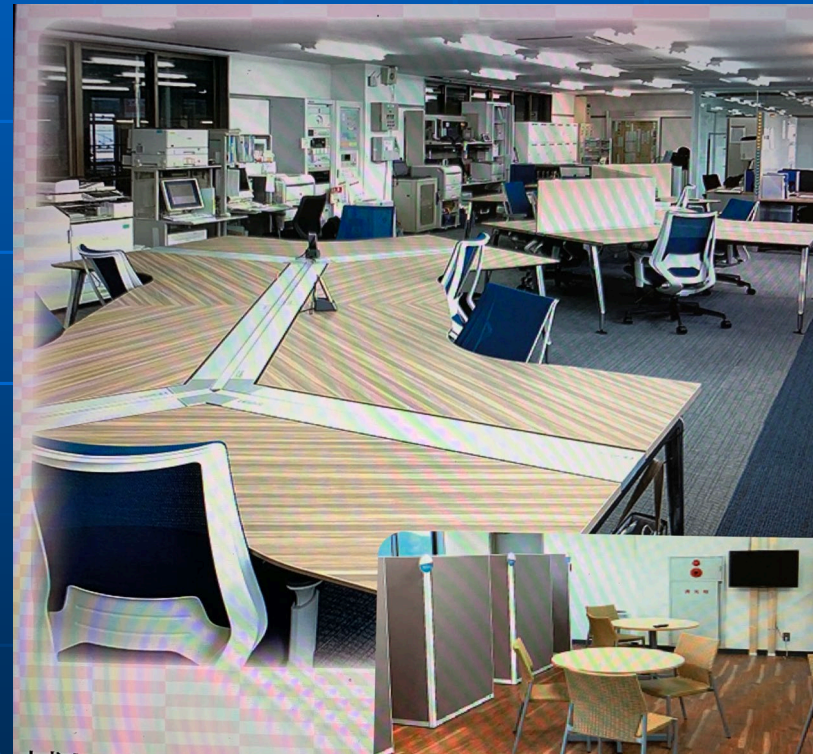


New Model Yamanote Line

**Driverless Operation**

# 4. What are the Japan's innovation and the goal of the Company's crew reform?

By modifying the crew's workplace areas into one floor, the Company creates a management system to oversee the crew members even during the breaks.

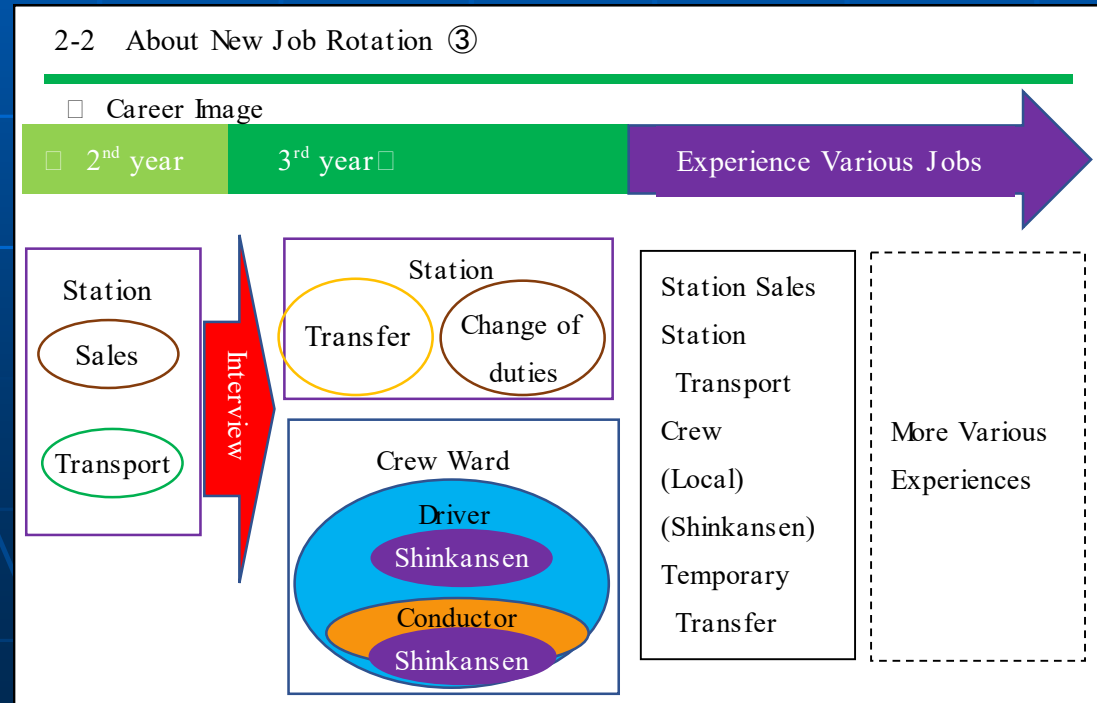


One floor of a workplace



# 4. What are the Japan's innovation and the goal of the Company's crew reform?

The crew members working at the same job type for up to 10 years will be mandatorily transferred to a different section to do a different line of work. It is hard for them to envision their future in the Company and they see a risk that they will lose pride for their job and the system.



# 5. Expected Problems

Introducing AI and IoT systems

Nurturing the quality of human labor for the crew members who are responsible for the safety

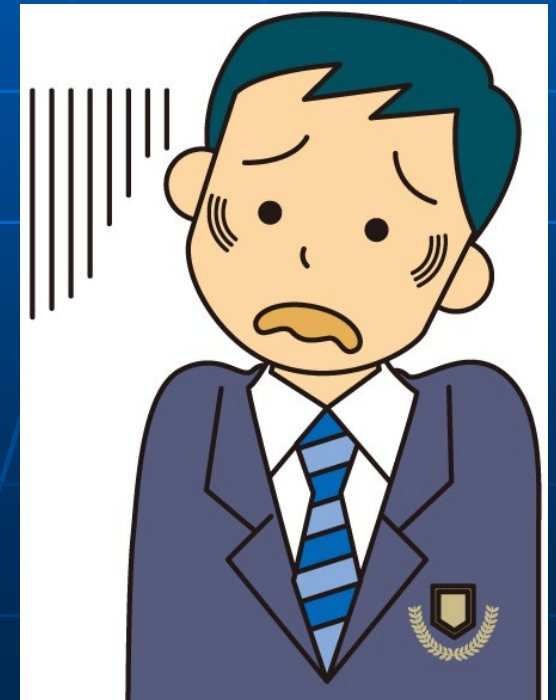
In the case of train crew members

Job rotation with a shallow tenure

Lack of Responsibility & Professionalism

Increased dependency on systems

Major deterioration of human ability in crisis management



# 5. Expected Problems



# Improving crew's ability in Crisis management

## People

Sharing each other's  
experiences

Education based on  
cause investigation

## Thing

Learning from  
Accident

Onboard Training

Creating Manual

A management system that understands  
human factor is a positive safety culture

## 6. A policy-first measure is to create the workplace that pursues liability and a culture that denies human labor



A driver of the Tohoku Shinkansen, who left the Sendai station on time, but passed the Mizusawa-Esashi station for 2 minutes behind schedule.

The driver was struck with the sleepiness, but awoke at the call from the command center

The driver was very upset and incorrectly reported that the delay was because of a "station trouble" & "incorrect calculation"

After the driver calmed down and came back to the ward, he corrected himself saying that he was sleeping in some sections

# 6. A policy-first measure is to create the workplace that pursues liability and a culture that denies human labor

## Conversations b/w the section chief and the driver

Section chief “We assume you will be back on the job”  
“So, why don’t you have a medical check up?”

Driver “Okay. I will go to the medical check up”



The driver was diagnosed with mild  
to

Sleep Apnea  
Syndrome  
(SAS)

# 6. A policy-first measure is to create the workplace that pursues liability and a culture that denies human labor

The management said

“Think common sense as an adult”

“Write down why you delayed the train” repeatedly

“You must tell others you are going to the bathroom when you want to go”

“You can rely on the union, but you must know that you are an employee of this Company before a unionist.



The section chief told the driver that he was not fit as a train driver not because he was sleeping but because he did not report correctly. Then he was transferred to a station job.

# 7. Our Response

**The cause investigation by the union pointed out that**

- The real cause and a widely shared corporate flow of SAS is important.
- The cycle and method of the periodical checkups should be changed.
- Some items should be included in the medical aptitude test.

**At the Workplace Safety and Health Committee,**

Regarding the "correct report"... with the special characteristics of crew labor that make it difficult to report correctly due to the pressure from responsibility of tasks and the punitive workplace culture, the union proposed the ways in which human labor should be ideally managed.



# 7. Our Response

## Workplace atmosphere after the transfer

· Crew members are facing the extreme pressure that they will be forced to transfer if they make mistakes.



Many human errors  
10 incidents since September 2018

**100% answered**

Forced transfer is a pressure  
and the workplace is not lively

**Emergency situation ! !**

# 8. Proposal

“Establishment of an in-house management system that focuses on human labor”

Human beings are to make mistakes

Education based on investigation of the causes



Learn from the accident

A management system that understands human factor is a positive safety culture

# 8. Proposal

Securing working conditions and training programs that improve the quality of human labor including crisis management

Technological innovation & Systematization in Railways

=

Deterioration of sensibility due to simplification of human labor

The rotation including multi-functionalization of the crew

Premise of individual preference to job type

The railway safety must be secured by all means

- Training curriculum
- Job pride & satisfaction
- Permanent employment system; and seniority pay

The culture that focuses on the safety and the improvement of productivity

# 9. Conclusion

“Human is not a straight line. A safety system should be created on the assumption that humans do make mistakes, but I think it is better not to build too many extra systems. Human is able to respond to things appropriately by experiencing dangerous things with some degree of freedom. Paradoxically, it is more effective to have actual accident or failures than one hundred sermons. That said, major accidents certainly should not occur. It is my idea that accidents that cause casualties among customers should be prevented by the system, but other things should be left to human responsibility as much as possible... There is no end to safety management. And there should be a vision and the philosophy. After all, safety is a matter of top management.”



Shuichirou  
Yamanouchi

# Thank you!



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