

Claims

1. Method for a digital system (1) for predicting and measuring risk measures for an occurrence of an impact event impacting physical loss or damage (33) on cargo or cargo logistics services having an impact (30) with a measurable impact strength (31) related to an impact type (32) on the cargo (10) or the cargo logistics services, the impact strength (31) being quantified by measuring an impact severity or intensity (311) and an impact duration (312) and/or an impact frequency (313), characterized

in that sets (13) of measurable cargo logistics parameters (11) are captured by the system (1) as logistics input signals (400) from a cargo logistics services database (41) via a data interface (21) and transmitted to an allocation structure (22) of a processing unit (20), each set (13) of measurable cargo logistics parameters (11) at least comprising parameters (12) defining the cargo or parameters (42) or defining the logistics services, the set (13) of measurable cargo logistics parameters (11) at least comprises cargo parameter values capturing cargo characteristics including cargo weight (121) and/or cargo size (122) and/or cargo fragility (123) and/or cargo value (124), and logistics parameter values capturing logistics characteristics including cargo packaging design (421) and/or departure location characteristics (422) and/or destination location characteristics (423) and/or transportation channel characteristics (424) and/or transportation means (425), wherein the cargo and logistics parameters (11) are at least partially detected and transmitted by tracking devices (80) comprising RFID chips or telematic devices or GPS sensors installed at the cargo (10), the tracking devices (80) measuring parameter values for geo location of the cargo (10), the orientation of the cargo or the velocity of the cargo and transmitting them via a data transmission network (70) to the cargo logistics services database (41),

in that at least one risk factor (52) indicating a measured impact probability for the cargo (10) or the cargo logistics services is generated by a risk modelling structure (26) of the processing unit (20) based on at least the measured parameter values of the impact strength (31) and/or impact types (32) and/or measured quantified damages (33) and provided for the allocation structure (22) of the processing unit (20), each of the risk factors (52) at least corresponds to a measured impact strength (31) or impact type (32) of a negative impact (30) on the cargo (10) or

the cargo logistics services, or a quantified damage (33) at the cargo (10) or on the cargo logistics services resulting from the impact (30), and

in that an aggregated risk measure (60) for the cargo or cargo logistics services is automatically generated by an aggregating structure (25) of the processing unit (20) based on the at least one risk factors (52) allocated to measurable cargo logistics parameters (11) of the set (13) of measurable cargo logistics parameters (11), and is provided as output signal (600) by a signal generator (24) to predict an occurrence of a measurable negative impact (30) on the cargo (10) and/or the cargo logistics services.

10 2. Method according to claim 1, characterized in that the aggregated risk measure (60) is assigned to the set (13) of measurable cargo logistics parameters (11) by the allocation structure (22) and provided as extended output signal (610) to the cargo logistics services database (41) by the signal generator (24) via a data interface (21).

15 3. Method according to claim 1 or 2, characterized in that at least one risk factor (52) is based on measurable risk parameters (311, ..., 321, ..., 331) indicating a damage in form of delay, damaging and/or loss of cargo, and/or in form of damaging of goods caused by the cargo logistics services.

20 4. Method according to one of the claims 1 to 3, characterized in that at least one risk factor (52) is based on measurable risk parameter values capturing a time of delay (333), a quantified damaging extend (33) and/or loss (34) of the cargo (10), and/or a quantified damaging extend of goods caused by the cargo logistics services.

25 5. Method according to one of the claims 1 to 4, characterized in that a risk factor (52) for an associated cargo logistics parameter (12, 42) is established by measuring the physical impact strength (31) or impact type (32) of impact events on the cargo (10) and/or the cargo logistics services affected by the impact event, measuring the impact strength on the cargo or the cargo logistics services, measuring a damage (33) of the cargo (10) and/or the cargo logistics services caused by the impact event, and/or quantifying a probability of impact occurrence.

6. Method according to one of the claims 1 to 5, characterized in that cargo logistics services include cargo handling, packaging, transportation, tracking, delivery and/or insuring, and/or logistics quoting, booking, scheduling, alerting, controlling and/or processing cargo formalities.

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7. Method according to one of the claims 1 to 6, characterized in that the aggregated risk measure (60) is determined based on historical measures of risk parameter values for one or more cargo logistics parameters (12, 42) defining the cargo logistic services, wherein the output signal (400) is indicative of the aggregated risk measure (60) for the cargo logistic services in respect to the set (13) of measured values for the cargo logistics parameters (11).

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8. Method according to one of the claims 1 to 7, characterized in that the aggregated risk measure (60) is generated by the aggregating structure (25) and allocated to the set (13) of measurable cargo logistics parameters (11), the aggregated risk measure (60) providing an aggregated impact probability measure value for the cargo logistics services to be involved in one or more impact events having a negative impact (30) with a measurable impact strength (31) and/or impact type (32).

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9. Method according to one of the claims 1 to 8, characterized in that the processing unit (20) and/or the risk factor database (50) include a damage or risk modelling structure (26; 26') generating a risk factor (52) for a measurable cargo logistics parameter (11) based on a measured impact strength (31) and/or impact type (32), and/or a measured quantified damage (33).

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10. Method according to one of the claims 1 to 9, characterized in that the allocation structure (22) assigns a risk factor (52) to a measurable cargo logistics parameter (11) by:

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receiving a measurable cargo logistics services parameter (11) defining the cargo logistics services or the cargo (10) from the cargo logistics services database (41) via the logistics input signal (400),

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selecting at least one risk factor (52) provided by the risk factor database (50) via the risk input signal (500) for an at least similar cargo logistics parameter (12, 42)

indicating a damage probability measure based on past measured damages caused by past measured impact events related to the cargo logistics parameter (12, 42) and/or generated by a risk modelling structure (26, 26') for a measurable impact event, and

- 5 allocating the at least one risk factor (52) to the measured cargo logistics services parameter (11) defining the cargo logistics services.

11. Method according to one of the claims 1 to 10, characterized in that an aggregated loss risk measure indicating a loss of the cargo by the cargo logistics services is generated based on the risk factors (34) associated to the measured cargo
10 logistics services parameter by the aggregating structure (22).

12. Method according to one of the claims 1 to 11, characterized in that an optimization structure (28) of the processing unit (20) optimizes the set (13) of measurable cargo logistics parameters (11) for a cargo logistics service to minimize the probability of the occurrence of an impact event on the cargo logistic service
15 indicated by the aggregated risk measure (60).

13. Method according to one of the claims 1 to 12, characterized in that an optimization structure (28) of the processing unit (20) receives cargo logistics services characteristics from the logistics input signal (400) and a set of risk factors (51) for one or more of the cargo logistics services characteristics from the risk factor database (50),
20 wherein the optimization structure (28) selects the cargo logistics parameter (12, 42) comprising the lowest risk factor (52) for each cargo logistics services characteristic, and combines the lowest risk cargo logistics parameters (12, 42) to define the set (13) of measurable cargo logistics parameters (11).

14. Method according to claim 13, characterized in that the lowest risk
25 factor (52) is defined by a lowest physical impact strength (31) of impact events on the cargo (10) and/or the cargo logistics services affected by the impact event, a lowest impact strength (31) on the cargo (10) or the cargo logistics services, a lowest damage of the cargo (10) and/or the cargo logistics services caused by the impact event, and/or a lowest probability of impact occurrence.

15. Method according to one of the claims 1 to 14, characterized in that the aggregation structure (25) and/or the optimization structure (28) may be combined with an artificial intelligence structure comprising a machine learning algorithm.

16. Digital system (1) for predicting and measuring risk measures for an occurrence of an impact event on cargo logistics services causing a negative impact (30) with a measurable impact strength (31) related to an impact type (32) on the cargo (10) or the cargo logistics services, the impact strength (31) being quantified by measuring an impact severity or intensity (311) and an impact duration (312) and/or an impact frequency (313), characterized

in that the system (1) comprises a processing unit (20) and at least one data interface (21) associated with data access means to a cargo logistics services database (41) for capturing sets (13) of measurable cargo logistics parameters (11) as logistics input signals (400) from the cargo logistics services database (41), wherein sets (13) of measurable cargo logistics parameters (11) are transmitted to an allocation structure (22) of the processing unit (20), each set (13) of measurable cargo logistics parameters (11) at least comprising parameters (12) defining the cargo or parameters (42) defining the cargo logistics services, the set (13) of measurable cargo logistics parameters (11) at least comprises cargo parameter values capturing cargo characteristics including cargo weight (121) and/or cargo size (122) and/or cargo fragility (123) and/or cargo value (124), and logistics parameter values capturing logistics characteristics including cargo packaging design (421) and/or departure location characteristics (422) and/or destination location characteristics (423) and/or transportation channel characteristics (424) and/or transportation means (425), wherein the cargo and logistics parameters (11) are at least partially detected and transmitted by tracking devices (80) comprising RFID chips or telematic devices or GPS sensors installed at the cargo (10), the tracking devices (80) measuring parameter values for geo location of the cargo (10), the orientation of the cargo or the velocity of the cargo and transmitting them via a data transmission network (70) to the cargo logistics services database (41),

in that the processing unit (20) comprises a risk modelling structure (26) for generating at least one risk factor (52) indicating a measured impact probability for the cargo (10) or the cargo logistics services and for providing the at least one risk factor (52) to the allocation structure (22) of the processing unit (20), each of the risk factors

(52) at least corresponds to a measured impact strength (31) or impact type (32) of a negative impact (30) on the cargo (10) or the cargo logistics services, or a quantified damage (33) at the cargo (10) or on the cargo logistics services resulting from the impact (30), wherein at least one measurable cargo logistics parameter (11) of a set
 5 (13) of measurable cargo logistics parameters (11) is assigned a risk factor (52) by the allocation structure (22) that corresponds to a measured value of the measurable cargo logistics parameters (11), and

in that the system (1) comprises a signal generator (24) and an aggregating structure (25) for automatically generating an aggregated risk measure (60) for the
 10 cargo (10) and the cargo logistics services based on the risk factors (52) allocated to measurable cargo logistics parameters (11) of the set (13) of measurable cargo logistics parameters (11), wherein the aggregated risk measure (60) is provided as output signal (600) by the signal generator (24) to predict an occurrence of a measurable negative impact on the cargo (10) and/or the cargo logistics services.

15 17. System according to claim 16, characterized in that the cargo logistics services database (41) and/or the risk factor database (50) comprise a persistent data storage storing data representing the measurable cargo logistics services parameters (11) and/or representing the risk factors (52).