



Methods for Health Technology Assessment of Medical Devices: a European Perspective

Adoption Decisions and Organizational Impact of Medical Devices

*Final Conference – Milan
12-13 November 2015*

Prof. Dr. Jonas Schreyögg



Project Funded under FP7 - HEALTH
Grant Agreement no.305694

Agenda

1. Systematic review of factors driving adoption and diffusion

2. Empirical analysis of adoption decisions for medical devices

3. Conclusions and recommendations for HTA

Systematic review: methods

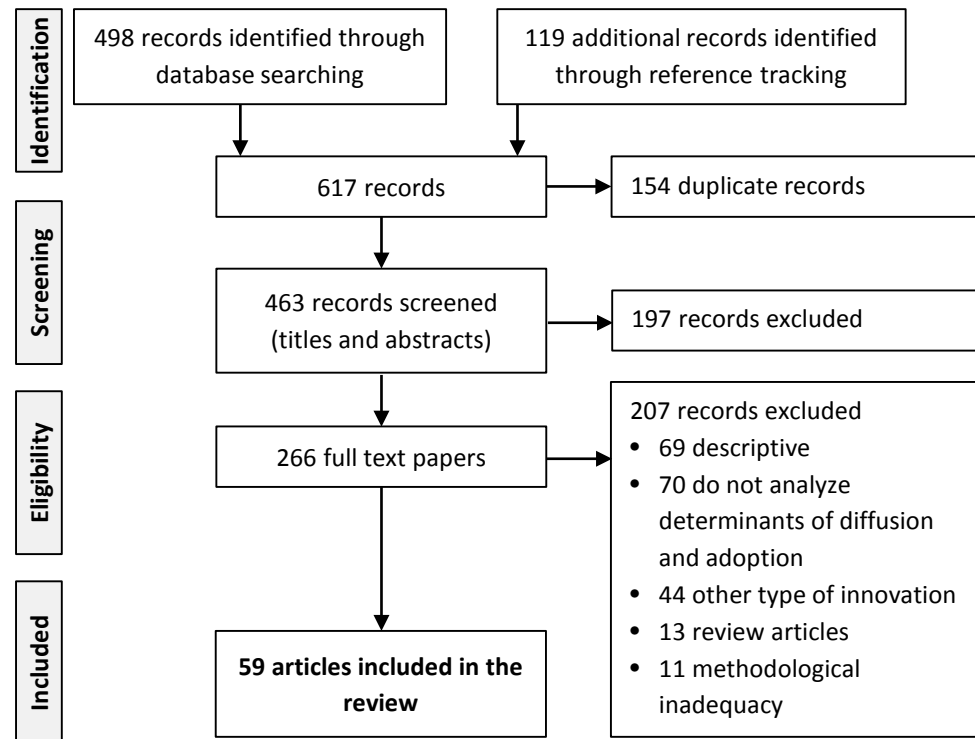
Databases

CINAHL, Business Source Complete, EconLit, ERIC, MEDLINE, Web of Science

Flow of information through the different phases of our systematic review

Inclusion criteria

- (1) the analysis needed to occur in **health care settings**,
- (2) medical technologies needed to represent **new treatment and diagnostic modalities** that required the acquisition of capital equipment,
- (3) the analysis needed to investigate the **factors facilitating or inhibiting diffusion and adoption**,
- (4) the analysis needed to provide more than a shallow description and needed to be based on **empirical data**,
- (5) the study needed to be published in an academic journal **in English**.



Systematic review: results

- 645 variables were associated with the adoption of medical technologies
 - Lowest number of variables in the category individual determinants
- Mean number of analyzed determinants was 11 (range: 3-35)

Environmental (138)	Organizational (243)	Individual (39)	Innovation-related (225)
Health care system <i>(e.g., health expenditure)</i>	Type and structure of organization <i>(e.g., size, ownership)</i>	Adopter characteristics <i>(e.g., age, tenure, gender)</i>	Innovation attributes <i>(e.g., clinical advantage, compatibility)</i>
Type of insurance <i>(e.g., public, private, patient co-payment)</i>	Strategic positioning <i>(e.g., technology leadership, price competitiveness)</i>	Values and attitudes <i>(e.g., cosmopolitanism, self-efficacy, risk propensity)</i>	Information and costs of innovation <i>(e.g., evidence base, uncertainty, risk, costs)</i>
Regulatory environment <i>(e.g., provider reimbursement)</i>	Organizational climate <i>(e.g., attitude toward change, communication)</i>		
Competitive environment <i>(e.g., hospital competition, income)</i>	Interorganizational links <i>(e.g., structural links, information exchange)</i>		

Agenda

1. Systematic review of factors driving adoption and diffusion
- 2. Empirical analysis of adoption decisions for medical devices**
3. Conclusions and recommendations for HTA

Empirical analysis: objectives

Background

- Systematic reviews (including our own) have identified diverse factors driving adoption (e.g. Rye and Kimberly 2007, Ghodeswar and Vaidyanathan 2007)
- Research gaps exist
 - Activities /Marketing by manufacturers
 - physicians' values and interests etc.
- Unclear how diverse factors are related to the adoption of medical devices
- Surveying physicians seems promising

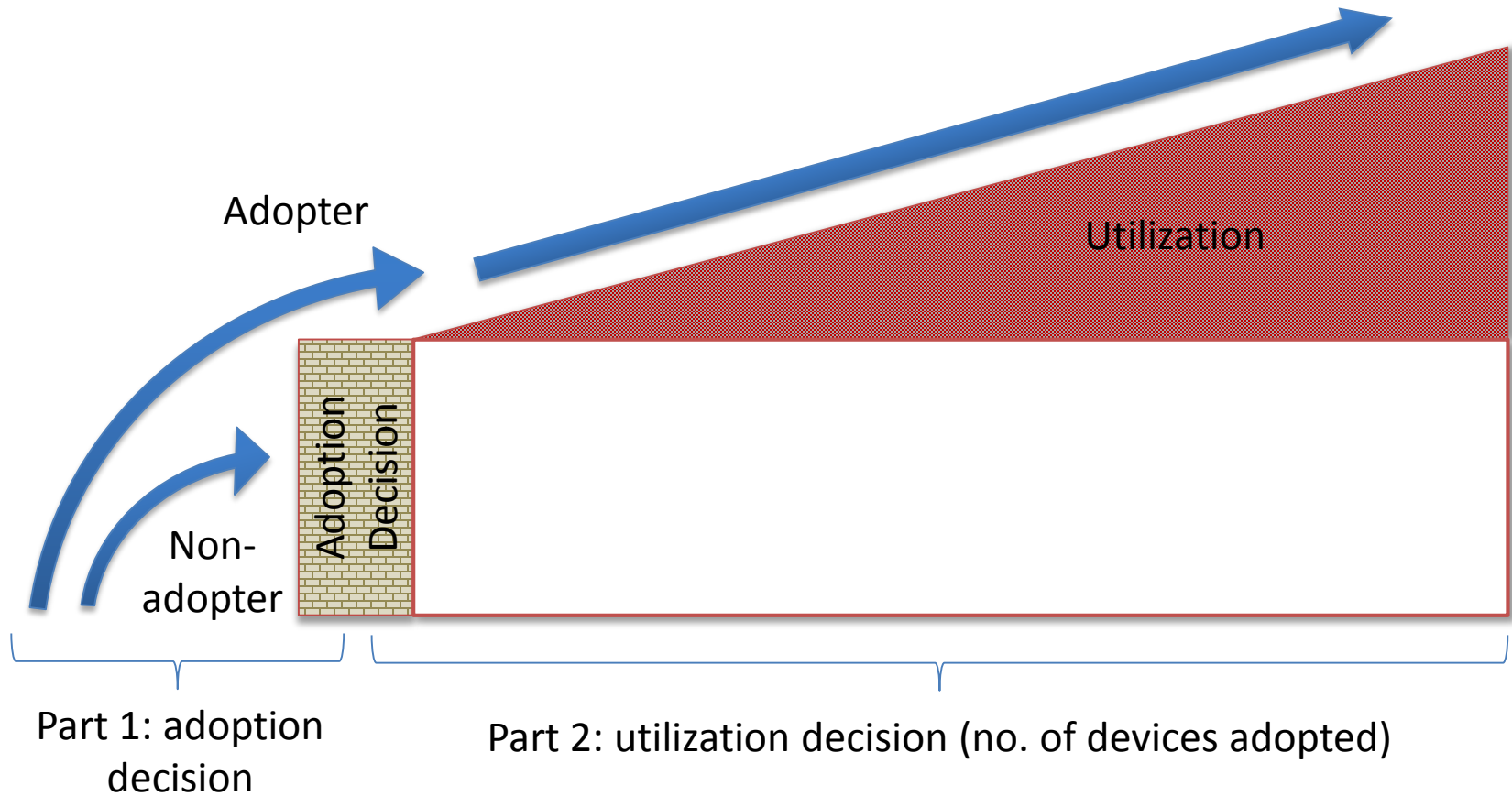
Objectives

- Analyze the role of factors on
 - environmental
 - organizational
 - individual
 - innovation level

concerning the adoption of seven selected cardiovascular devices („new“ & „old“ devices)

Empirical analysis: methods

Hurdle Model



Empirical analysis: methods

Part 1: Adoption decision

Part 2: Utilization decision

Adoption
(yes/no)

= **f**

- **Environmental level**
 - GDP, out of pocket payment
 - region
- **Organizational level**
 - department size, hospital size, potential change in human resources, work flows, planning of activities and organizational structure
 - budget pressure, competitive pressure
- **Individual level**
 - hedonic, functional, social, and cognitive motivation
 - experience, number of scientific conferences visited, number of salesman visits, position, specialty, sex, additional economic qualification
- **Innovation level**
 - medical evidence, manufacturer support, costs, profitability, cost-effectiveness

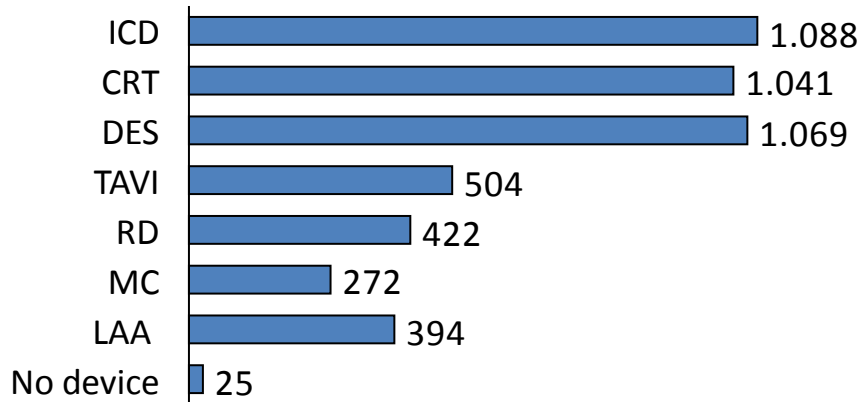
Utilization
(# devices) = **f**

- **Environmental level**
 - GDP, out of pocket payment
 - region
- **Organizational level**
 - department size, hospital size
- **Innovation level**
 - medical evidence, manufacturer support, costs, profitability, cost-effectiveness

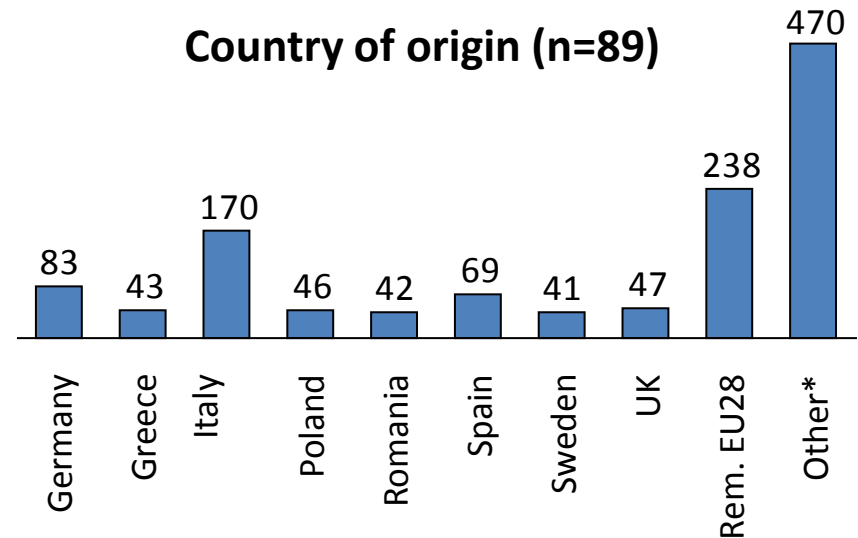
Empirical analysis: results

- Initial distribution to physicians of **European Society of Cardiology (ESC)** in Sep. 2014, three reminders
- Survey closed in the end of January 2015
- Overall response rate: 6%
- Response rate as percentage of total clicks on mailings: 96%
- Surveys from **1249** physicians after data refinement

Usage of devices



Country of origin (n=89)



*61 different countries (e.g. Egypt, India, Israel, Japan, Mexico, Russia)

Empirical analysis: results

Result patterns in groups of devices: “old” devices, “new” devices and across devices

“New” devices (TAVI, RD, MC, LAA)

Better manufacturer support



Higher adoption probability

“Old” devices (ICD, CRT, DES)

Existence of budget pressure



Higher adoption probability (ICD, CRT) [opposite to LAA – experimental /slack resources]

Organizational and environmental factors



Mainly associated with the utilization of “old” devices -> next slide

Empirical analysis: results

Across devices (“new” and “old” devices)

Medical specialty	⇒	Electrophysiologists rather adopt ICD, CRT, TAVI, Interventional Cardiologists rather adopt DES
Greater hospital size	⇒	Higher adoption probability (ICD, CRT, DES TAVI, MC) and higher utilization (ICD, CRT, DES)
Urban hospital location	⇒	Higher adoption probability (CRT, DES, RD, LAA) and higher utilization (ICD, DES, TAVI, MC)
Higher GDP	⇒	Higher utilization (ICD, CRT, TAVI)
Lower out of pocket payment	⇒	Higher utilization (ICD, CRT, TAVI)

Empirical analysis: discussion

- Medical evidence:
 - Rather weak evidence given its assumed role as a major driver of adoption
 - Often cited lack of medical evidence at the time of the adoption decision
 - Manufacturer activities to make physicians familiar with a device and to support adoption decision

- Financial aspects:
 - No clear evidence for the relevance of financial aspects concerning the adoption of medical devices
 - In line with findings from the literature

- Organizational and regulatory determinants:
 - Larger hospitals in urban regions and countries with higher GDP and lower out of pocket payments have a higher likelihood of adoption
 - Confirms what was found in other studies

Agenda

1. Systematic review of factors driving adoption and diffusion
2. Empirical analysis of adoption decisions for medical devices
3. Conclusions and recommendations for HTA

Conclusions and recommendations for forecasting technology adoption in HTA

Broad review
& large scale
survey

- Systematic review with broad overview of relevant factors
- Rich results from one of the largest surveys available including factors on four different levels

Device groups

- Diffusion stage should be used as indicator for device classification (“old” vs. “new” devices)

Medical evidence
versus
manufacturer
activities

- No confirmation of the assumed role of medical evidence as major driver of adoption
- Focus on manufacturer activities regarding the adoption speed of “new” devices

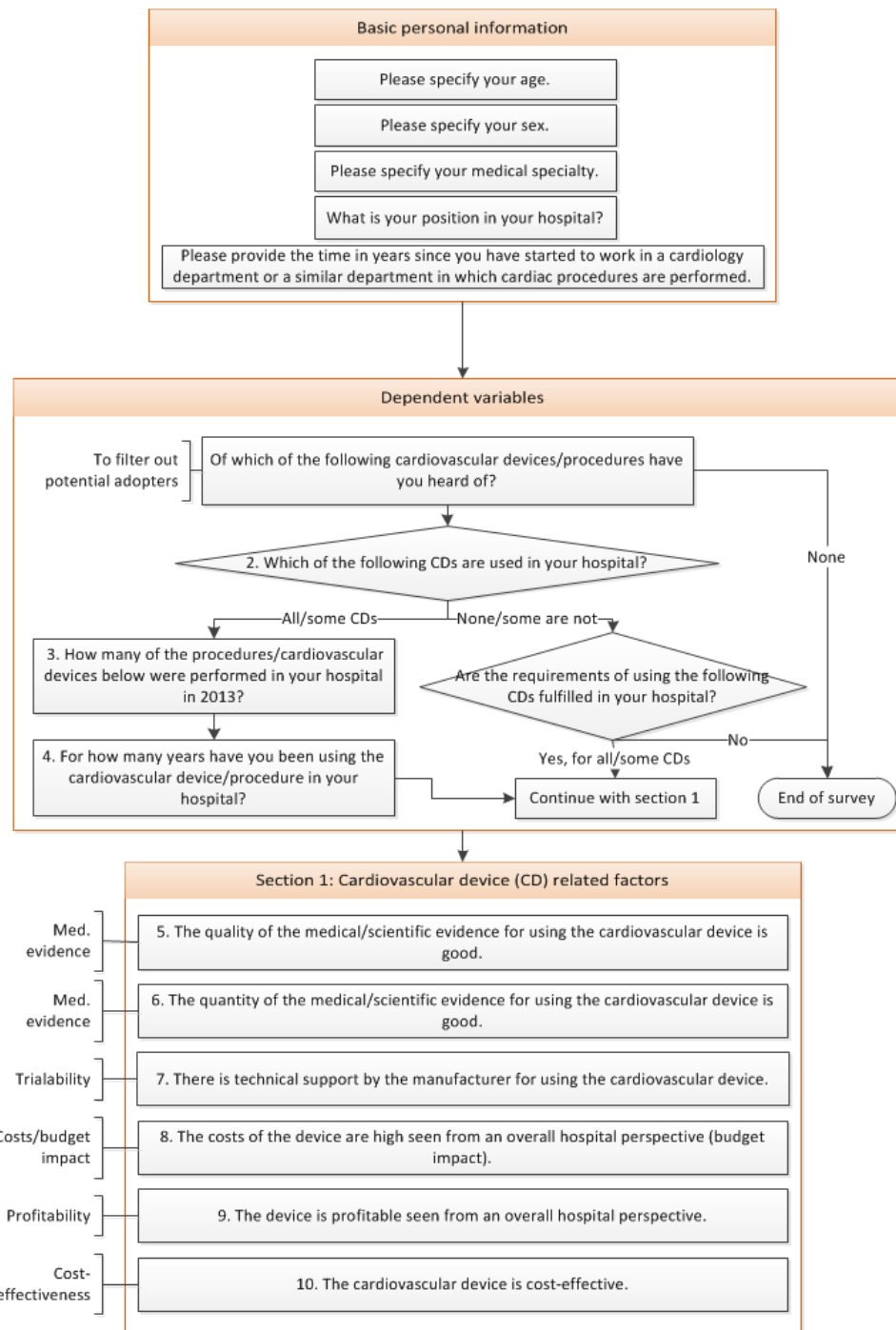
Initiators of
adoption &
diffusion

- Focus of HTA on organizational (large hospitals in urban regions) and regulatory (high GDP and low out of pocket payments) determinants

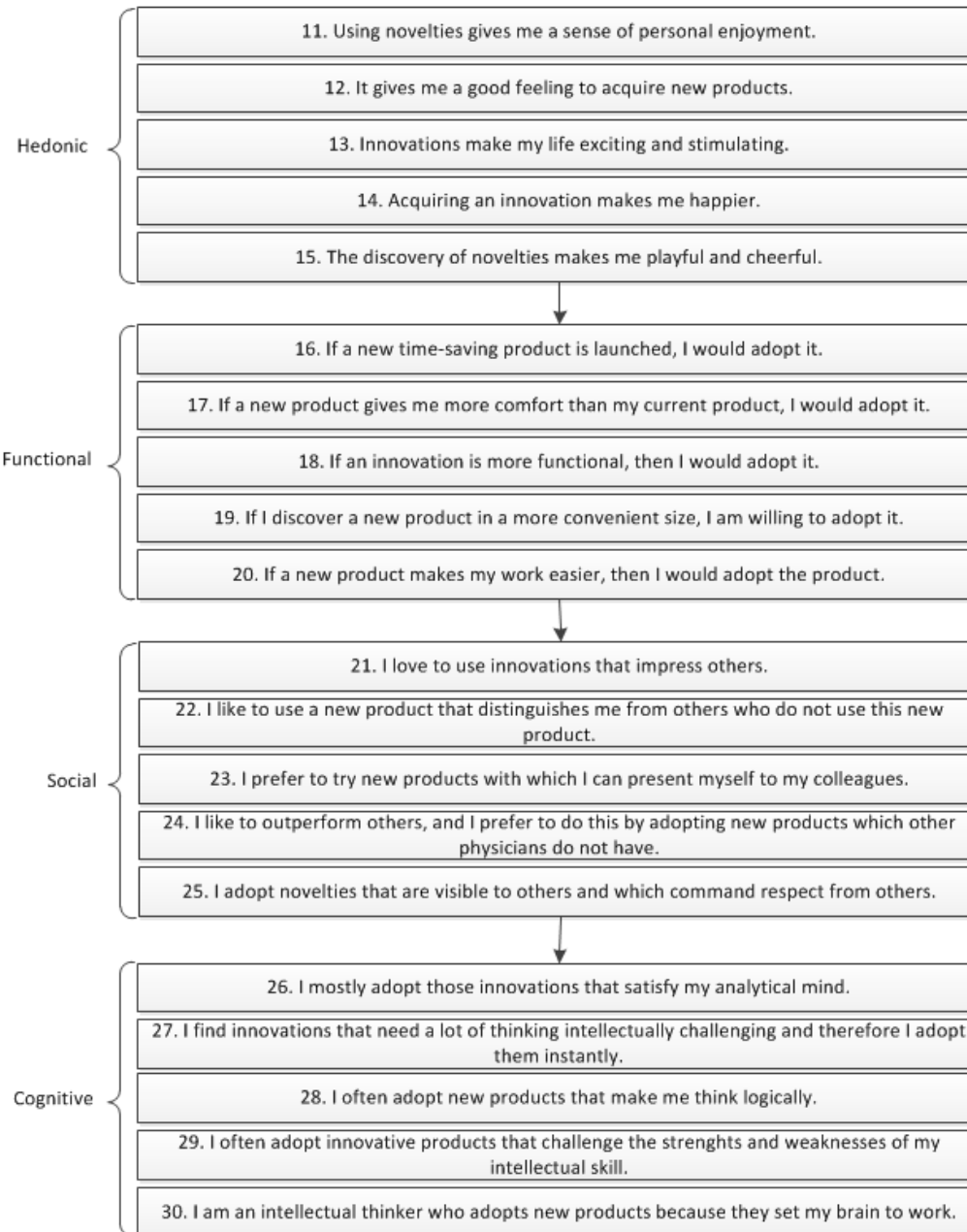
Backup

Online survey

- Page 1



Section 2: Motivation (Scale)



Section 3: Individual factors

31. Do you have an additional academic qualification in a business/economic related field?

32. How often do you participate in the following activities per year on average? (e.g. participation in scientific conferences, CD salesman visits)

33. Please estimate the percentage of your entire professional work load that you devote to the following categories (medical care, research, teaching, administrative work/other)

↓

34. Does your salary comprise variable remuneration? (e.g. stock options, bonus)

Yes

↓

34a. Which of the following indicators have an impact on your variable remuneration? (e.g. overall hospital performance)

↓

No

Section 4: Organizational factors

35. Do you work in a university hospital?

36. How many beds does your hospital have?

37. In which country is your hospital located?

38. Is your hospital located in an urban, suburban or rural area?

39. On which of the following levels are the decisions made to adopt new cardiovascular devices?

40. Please rate your personal influence on the decision to adopt a new cardiovascular device on the following scale.

41. The department I am working in is larger than most of the other departments in my hospital.

42. Budget pressure is influencing my decision to adopt new cardiovascular devices.

43. The adoption of new cardiovascular devices is driven by competitive pressure between the hospital I am working in and other hospitals.

44. The adoption decision is influenced through potential change in human resources (i.e. training of personnel, hiring additional personnel).

45. The adoption decision is influenced through potential change in work flows/processes (i.e. patient pathways, different processes during interventions).

46. The adoption decision is influenced through potential change in the planning of activities (i.e. scheduling and planning of interventions).

47. The adoption decision is influenced through potential change in organizational structure (i.e. modification of organizational charts/team structure, division of work between different units).

Organizational
impact of
adoption