Response to Ofwat Consultation: "Driving transformational innovation in the sector"

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Q:1 WHAT ARE THE MAIN BARRIERS TO INNOVATION IN THE SECTOR AND WHY?

Recent studies of the UK water industry have highlighted low innovation, slow adoption of innovation, lack of investment in research and development and doubts about the sector's innovation capacity. However, there is a gap in the knowledge in terms of innovation models in the UK water sector regulation framework context. Accordingly, this response builds on research undertaken as part of doctoral research at the Global Sustainability Institute, Anglia Ruskin University completed in late 2019.

This research employed a mixed methods research design. Semi-structured detailed interviews were completed within twelve senior representatives from water and sewerage companies (WaSCs) from across the UK. Questionnaires were completed by 142 representatives of supply chain firms. The study's key findings were then brought together and examined by 38 professionals of the water sector stakeholders through a consultation exercise where a consultation questionnaire comprising study's key results (refer Appendix A) was sent to the sector's key stakeholders (e.g. the EA, DWI, Ofwat, Waterwise, UKWIR, WEDC etc.) in 2018 to finalise results of the study.

A number of barriers to innovation were found and nine actions for improving innovation in the water sector were proposed in this study as a way to tackle these barriers. The action plan includes both policy and practice related actions. It describes suggested actions and

who should take those actions, to improve innovation in WaSCs and the supply chain in the context of the water sector regulation framework, and is provided in Table 1. These actions would be much more effective if they were considered for implementation in combination rather than in isolation.

Table 1: Policy-Practice Action Plan

	Action by whom	Action	Consultation results
1	*WaSCs and Supply Chain (Lead)* *Ofwat, Customer Challenge Groups*	Sharing of risks in the event of failure and rewards for successes among WaSCs, supply chain, customers and other potential beneficiaries to increase innovation in WaSCs and supply chain.	Generally agreed by regulatory stakeholder groups Highest degree of agreement among non- regulatory stakeholder groups.
2	*Ofwat, DEFRA, EA, WaSCs (Lead)* *Customer Challenge Groups*	The inclusion of large-scale research schemes in WaSCs' business plans to increase innovation in WaSCs and their supply chains.	Agreed by the majority of regulatory and non- regulatory stakeholder groups.
3	*Ofwat, DEFRA, EA, WaSCs (Lead)*	A longer-term price control period to increase innovation, considering the outcomes and totex environment.	Agreed by more than half of the participants from the stakeholder groups.
4	*Ofwat, DEFRA, EA, WaSCs (Lead)*	An alignment in regulatory expectations and WaSCs' aspirations to assist companies to set clearer longer-term outcomes.	Agreed by regulatory and non-regulatory stakeholder groups.
5	*WaSCs (Lead)*	WaSCs to create a culture of exploring solutions globally to bring innovative ideas and technology into the company from the rest of the world and other industries.	Agreed by regulatory and non-regulatory stakeholders groups.
6	*WaSCs (Lead)*	Engaging individuals and empowering them in the process of innovation to motivate	Agreed by regulatory and non-regulatory stakeholder groups.

		individuals in contributing towards innovation.	
7	*WaSCs (Lead)* Ofwat	Ofwat and WaSCs to work together in reviewing provisions of economic regulation that discourage WaSCs from joining together as a sector.	Agreed by regulatory and non-regulatory stakeholder groups.
8	*WaSCs, Supply Chain (Lead)*	Increasing collaboration between WaSCs and supply chain to increase innovation adoption in WaSCs and innovation development in supply chain.	Agreed by regulatory and non-regulatory stakeholder groups.
9	*WaSCs, Ofwat, DEFRA, EA (Lead)*	A closer working relationship between regulators and WaSCs to align medium (5 to 10 years) and longer-term (more than 10 years) goals and aspirations which could encourage WaSCs to take up medium- and longer-duration research with the supply chain. Ofwat to promote and facilitate a closer working culture between WaSCs and regulators.	Agreed by regulatory and non-regulatory stakeholder groups.

The above nine actions are summarised within five themes, alongside the barriers which they tackle, below.

Sharing of Innovation Risks (Action 1 and 2)

The sharing of risks in the event of failure and rewards for successes among WaSCs, the supply chain, customers and other potential beneficiaries could increase innovation in WaSCs and the supply chain. The current approach of WaSCs for sharing risks is a barrier to innovation for supply chain firms. There is a positive correlation between risk-sharing and collaboration. There is also a strong positive relationship between adoption and collaboration which suggests improved collaboration and risk-sharing tends to increase adoption of innovation in WaSCs. WaSCs also need to be more proactive in engaging supply chain

partners and offering them attractive incentives alongside risk-sharing. This suggestion is consistent with the view of Gray (2011), who commented that the system of incentives applied by the economic regulator might be too focused on penalties and compliance as opposed to positive incentives for desired changes of behaviour in WaSCs. The consultation result (undertaken in the study with key stakeholder groups) validated that the sharing of risks in the event of failure and rewards for successes could increase innovation in WaSCs and their supply chain.

As agreed by the majority of regulatory and non-regulatory stakeholder groups, inclusion of large-scale research projects in companies' business plans is likely to increase innovation in WaSCs and the supply chain. Customers may have to pay slightly more initially to include research in business plans, but in the longer term, the companies, customers and the environment would benefit from research projects. This would, however, need a step change in the current thinking of the economic regulator in respect of keeping customers' bills to the lowest level possible.

Longer Price Control Period (Action 3)

The study found that the five-year duration of the AMP does not support medium- and longer-term innovation due to WaSCs' propensity to concentrate on realising short-term benefits. The five-year duration of AMPs was seen by WaSCs as too short to realise the benefits of outcomes and totex, as decisions made on the basis of totex and outcomes strategy are generally for a longer period. The results of the supply chain data analysis also showed that the five-year AMP cycle has a negative influence on a supply chain firm's capacity to innovate and is a barrier to innovation. The results are consistent with those of various existing studies documented in the water sector (HM Treasury, 2012; Gray, 2011; Consumer Council for Water, 2006). HM Treasury (2012) highlighted that the period of core delivery under the AMP is around three years and raised concerns about the impact of the

five-year cycle on innovation. Gray (2011) commented that the effect of the AMP cycle is tied to the regulatory process, and WaSCs think investment around the times of the price review is too risky. A longer price control period can even out the peaks and troughs of the AMP cycle and incentivise companies, under the totex and outcomes model, to undertake longer-term innovation. The stakeholder consultation confirmed that a longer price control period could increase innovation in WaSCs and their supply chain firms. From the data collected in this research, it is not possible to make an assessment of how long an AMP period should be within the regulatory framework; a more detailed study and analysis for deciding the appropriate duration of price control period is needed, taking into consideration the interests of all stakeholder groups in the water industry. The Consumer Council for Water (2006) stated that numerous contractors employed by water companies might be likely to accept lower contract prices if investment programmes are of a longer duration and more predictable. Gray (2011) also suggested a need to change behaviour from a cyclical culture to steady investments, which is consistent with this study finding.

Regulatory Alignment (Action 4)

This study found a perceived lack of alignment in the thinking of various regulators. For instance, the most pressing expectation from the economic regulator is to keep customers' bills the lowest. The EA has their own expectations of improving the environment, and some of the environmental improvements obligations fall under WaSCs' functional areas. The EA's approach is to discharge those obligations and charge customers accordingly, which is not aligned with the thinking of the economic regulator. Similarly, there is a need to align the thinking of the regulators and WaSCs. For instance, totex and outcomes decisions are made for a longer duration, while a WaSC's performance is assessed on the basis of five-year window criteria. A closer working relationship between regulators and WaSCs to develop clarity on the regulators' aspirations and aligning those aspirations with the objectives of

WaSCs would assist companies to include clear outcomes in their business plan and find innovative solutions with their supply chain firms to achieve those outcomes. A closer working relationship could align medium- (5 to 10 years) and longer-term (more than 10 years) aspirations and encourage WaSCs to undertake medium- to longer-term research with the supply chain firms. The stakeholder consultation validated this suggestion.

Culture of Exploring Solutions Globally (Action 5 and 6)

Consistent with the stakeholders' consultation result, WaSCs should create a culture of exploring solutions globally to bring innovative ideas and technology into the company from the rest of the world and other industries. Further, behavioural change, engaging individuals and empowering them in the process of innovation could increase the adoption of new technologies/products, and motivate individuals to contribute more towards innovation. This suggestion, however, needs a further study on how to create a culture of exploring solutions globally in a WaSC in the water sector.

Increasing Collaboration (Action 7, 8 and 9)

This study suggests improving collaboration on three levels: first, increasing collaboration across WaSCs as a sector; second, increasing collaboration between WaSCs and the supply chain; and finally, a closer working relationship between regulators and WaSCs. The study found that there is not enough joint working culture and sharing of information across WaSCs. WaSCs can do much more innovation collectively as a sector. Increasing collaboration across WaSCs in research, development, trials and information-sharing as a sector could increase innovation. One of the reasons for the restrictive collaboration is related to the fear of breaking competition law. This acknowledges the need for a review of the Competition Act and policies that restrict WaSCs in collaborating as a sector, and also directs the attention of policy-makers to reviewing the provisions of economic regulation that

discourage WaSCs from joining together as a sector to deal with the sector’s challenges collectively.

The study also suggests increasing collaboration between WaSCs and supply chain firms, which could increase innovation adoption in WaSCs and innovation development in the supply chain. Furthermore, a closer working relationship between regulators and WaSCs could align medium- (5 to 10 years) and longer-term (more than 10 years) goals and aspirations which could encourage WaSCs to take on medium- and longer-duration research with their supply chains.

Ofwat could further promote and facilitate a closer working between WaSCs and regulators. The stakeholder consultation confirmed that increased collaboration across WaSCs and between regulators, WaSCs and the supply chain could increase the adoption of innovation in WaSCs and innovation in supply chain firms.

THREE PRIORITISED CHANGES TO INCREASE INNOVATION

The current temperament of WaSCs is very much towards savings in cost in AMPs. The constraints of the fixed domestic customers, the unchangeable nature of water and sewage products, a smaller market size for growth, continuous pressure from the economic regulator to keep water bills lower and a propensity to maximise financial rewards limit companies to undertaking innovations that mainly focus on what best can be saved in the delivery of the services and schemes during an AMP period. This short-term nature of maximising financial gains is an unintended consequence of the economic regulation, where a company retains the financial rewards of outperformance for an AMP period and thereafter passes the benefits of outperformance to customers in successive AMP periods.

In reality, customers' water bills have increased significantly after privatisation, and simultaneously, a lower rate of innovation has been very clearly documented in the literature on the water sector. WaSCs also feel it is easier to do innovation outside the regulated business than within the regulatory framework. Between these two end results, the concerns around short-term rewards maximising culture, lack of robust risk-sharing for uptake of innovation, slow adoption of innovation, lower investment in research and development and restrictive collaboration were identified in the study.

The delivery of schemes in an AMP period is influenced by the short-term rewards culture. The belief in restricting outperformance benefits to the five-year duration of an AMP and then transferring it to customers in successive AMPs has rooted this culture in the WaSCs. Therefore, outperformance gains to customers are not visible and sometimes this concept is seen sceptically. In addition, the five-year duration of an AMP does not support the thinking behind the outcomes and totex model and stifles longer-term innovation in WaSCs and the supply chain. The five-year duration of price control was reported as too short to realise benefits from outcomes and totex. The AMP duration also has a negative influence on supply chain firms' capacity to innovate. This is because an innovation to meet the specific needs of a WaSC or the sector could take much more than five years in a supply chain firm while contract extension beyond five years cannot be assured by the WaSCs. There are limitations to how much innovation can be delivered within the five-year duration. Therefore, an innovation with a payback period of more than five years becomes unattractive, despite it being in the longer-term interest of customers and the environment. The first key improvement is, therefore, **a longer price control period** which would provide steady investments to meet long-term outcomes under the outcomes and totex delivery model. The assessment of a perfect duration for an AMP needs further detailed quantification of long-term benefits due to its financial implications on customers and it not possible to determine this from the data sets gathered in this study.

The second key improvement for increasing innovation is **sharing innovation risks among potential beneficiaries and inclusion of medium- and large-scale research schemes** in companies' business plans. The inclusion of large-scale research projects in water companies' business plans could increase innovation in WaSCs and their supply chains. This could motivate WaSCs to increase innovation adoption, and supply chain firms to develop more innovation to achieve objectives set for research and development to the benefit of the environment, customers and the sector. The current approach of sharing innovation risks does not support innovation in supply chain firms. WaSCs also feel that all the risks of innovation failure remain with them an attitude which, however, was discarded by most of the stakeholders during the consultation. The approach to sharing risks in the event of failure and retention of rewards for success among customers, WaSCs, supply chain firms and other beneficiaries will place WaSCs and supply chain in a better position to manage risks related to innovation. The economic regulator (Ofwat), in consultation with WaSCs and other stakeholder groups, would be in the best place to take the lead on implementing this action along with the inclusion of medium- and large-scale research in business plans that could further encourage WaSCs to take up more research with supply chain firms in the UK and possibly internationally to bring innovation into the sector from other countries. Consequently, innovation in the water regulation framework will increase either by investing more (if they are current investors in the water sector) or starting investing (if they are new investors across sector around the world).

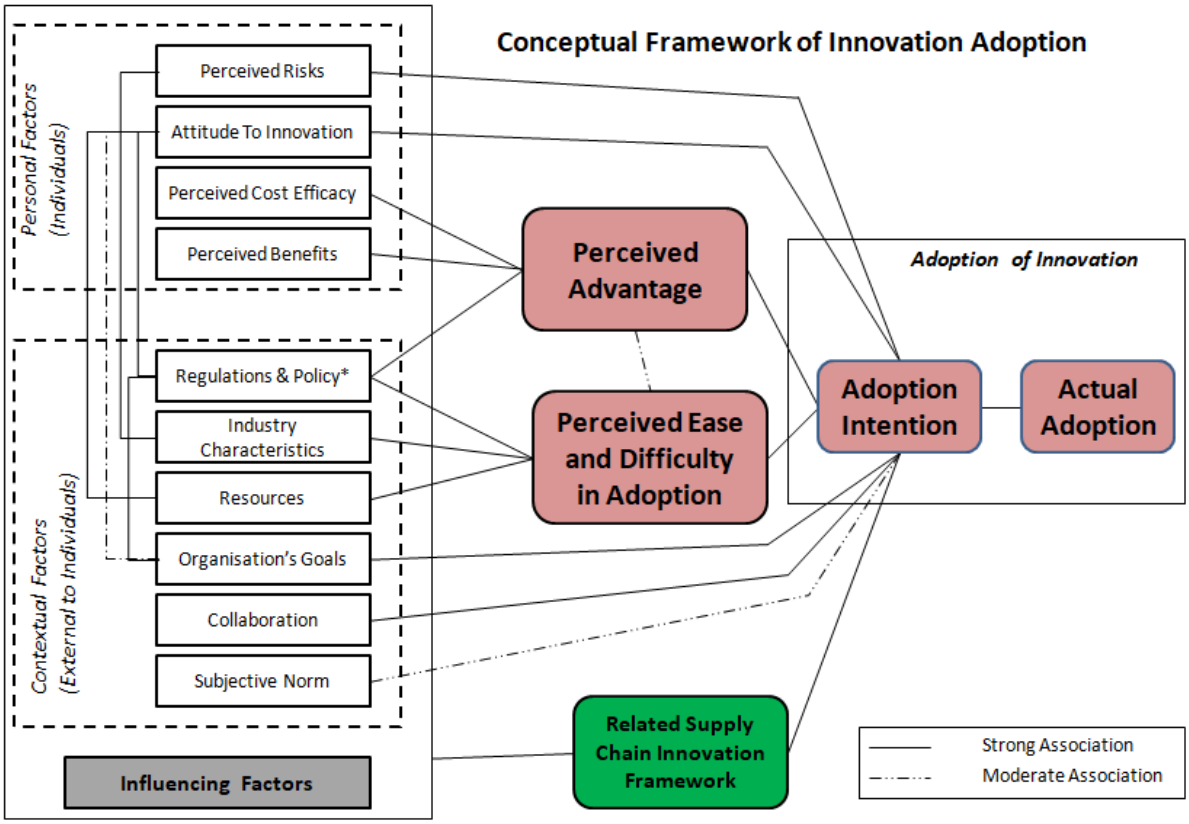
The third key improvement to increase innovation is to **increase collaboration as a sector**. This especially includes increasing collaboration across WaSCs through removing barriers raised by the perceived anti-competitive law and promoting a culture of joining up as a sector to promote long-term innovation. At present, there is silo thinking across WaSCs regarding innovation. The sharing of information is restricted due to commercial interests, while WaSCs can do much more innovation collectively through collaboration. The idea of

including medium- and large-scale research in business plans would create an environment for attracting more investment jointly for innovation. This would also encourage supply chain firms to utilise their potential to undertake research with WaSCs.

The three key changes: removing or reducing the short-term benefit culture through longer price control periods; sharing innovation risks-rewards among beneficiaries; and increasing collaboration across WaSCs as a sector along with an improvement in the adoption of innovation in WaSCs will increase innovation within the water regulation framework. These suggested changes could further attract wider high-tech innovating firms from other sectors to enter the water sector, researching and implementing innovative ideas to the benefit of companies, customers and the environment. This could make the industry more attractive for global companies to investment in innovation. The suggested actions would resolve the issues of low innovation and slow adoption of innovation highlighted in a number of previous studies (CST, 2009; Cave and Wright, 2010; UKWIR, 2006, 2011; Bridgeman, 2011; Schafer, 2011; Department of Business Innovation and Skills, 2013).

CONCLUSIONS AND CONCEPTUAL FRAMEWORK

This study proposed a Conceptual Framework (including supply chain innovation) which could be adopted by the UK water industry. Figure 1 shows the final Conceptual Framework of this study. In addition to demonstrate an improved understanding of innovation adoption in the WaSCs and innovation in supply chain firms, this framework proposes ways to increase the innovation in WaSCs and supply chain in the water sector regulation framework context.



* Finding related to clarity on research priorities at national level and future form of the industry was not supported in the stakeholders’ consultation.

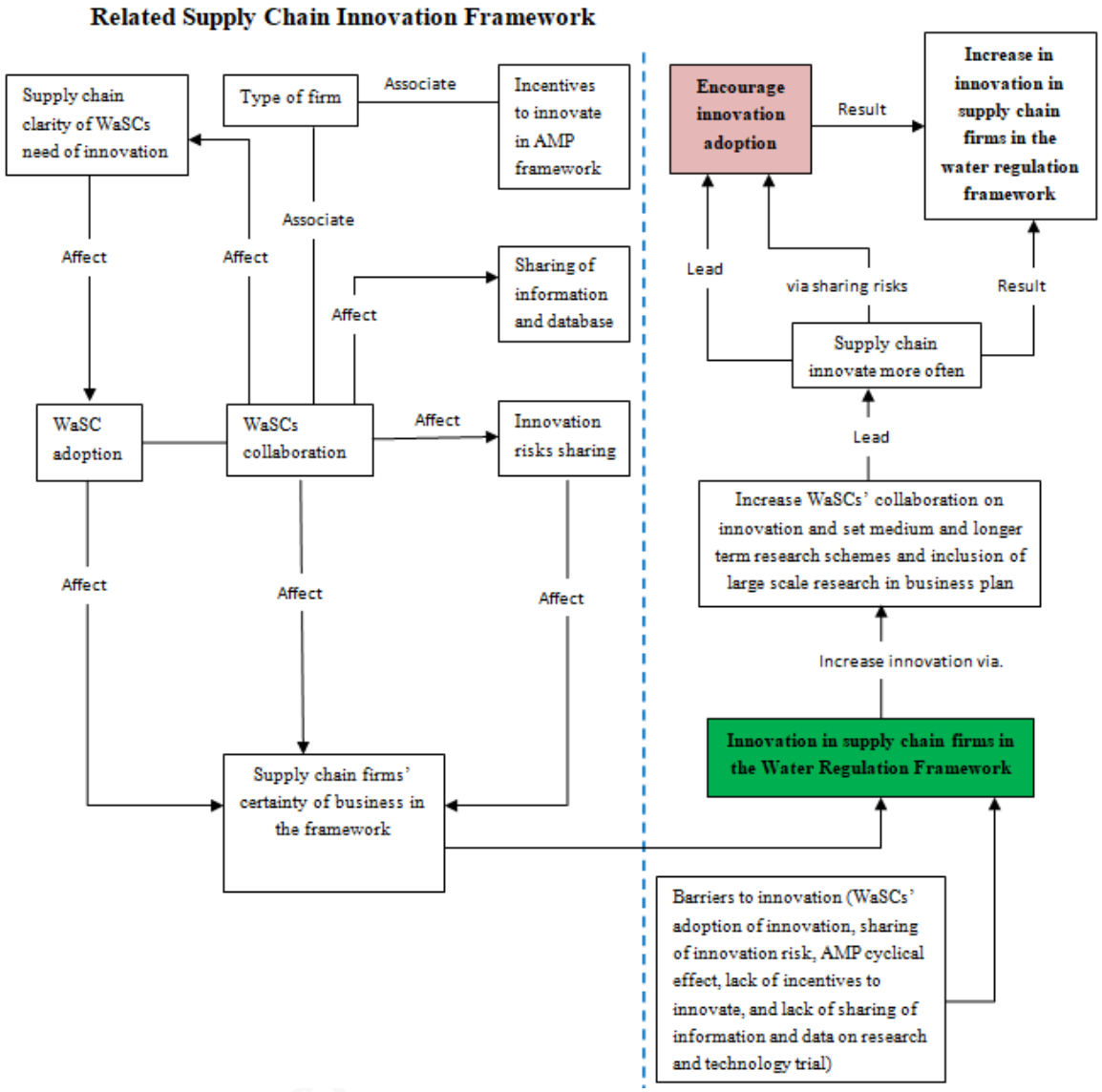


Figure 1: The Study's Final Suggested Conceptual Framework

In addition to water companies, this conceptual framework can be used by organisations such as UKWIR and UK Water Partnership (UKWP) whose aims are to promote innovation related research in the UK water sector. UKWP's initiatives such as 'Linking Innovation to Societal Needs (LITSoN), Facilities Register and Digital Water are intended to bring in positive changes in the UK water industry through adopting innovative approaches. The Digital Water initiative comprises adoption of digital approaches, techniques and thinking that could increase innovation in aspects from resource management and treatment

technology to operations and maintenance and resource recovery. UKWP brings together stakeholders to embrace digital revolution in water sector, capitalise commercial opportunities, improving long-term water security and resilience, and promote innovation in the water sector.

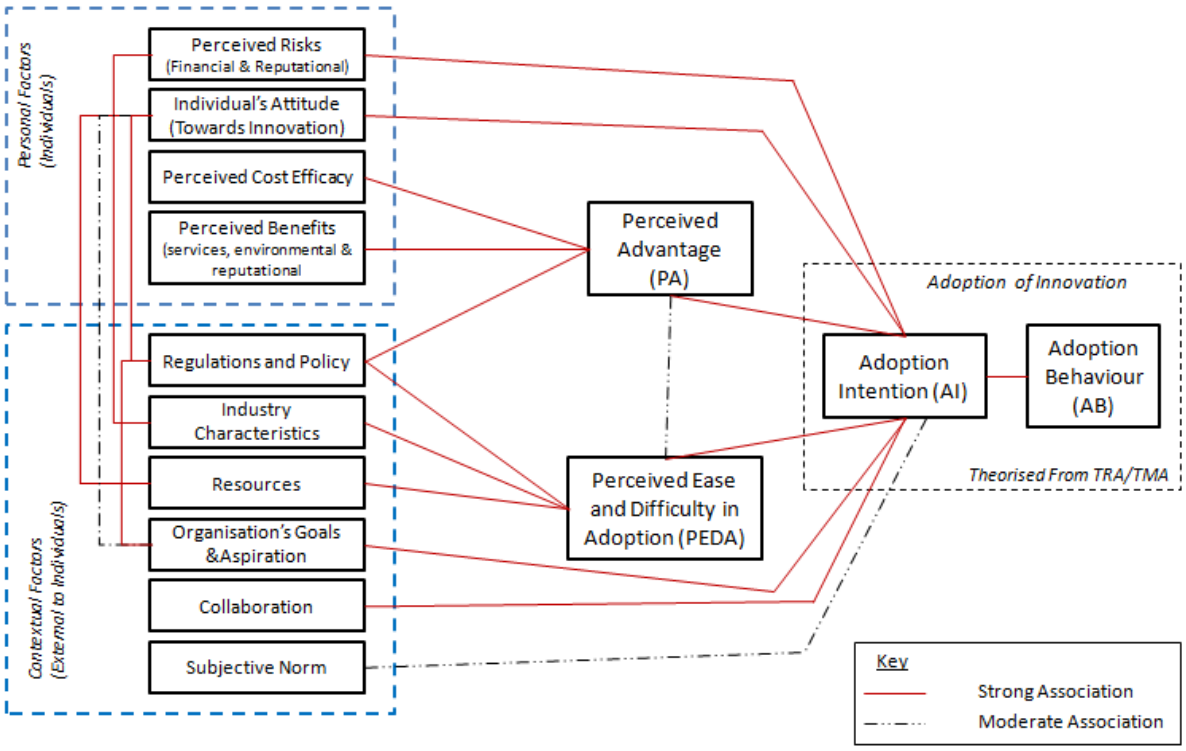
Another important aspect that impacts innovation and its adoption is revolutionary technology changes and catastrophic operational events. Climate change is real, and projections suggest extreme weather will occur more frequently in the future (Pitt, 2008; Cave and Wright, 2010; Bridgeman, 2011). The impact of such catastrophic events can be reduced by adaptive measures such as adoption of existing mitigating technologies and innovation of new technologies. While a longer term response to climate change will be seen through Regulation & Policy changes, natural disasters have a wide range of impacts and cause significant damage. A recent such event is a failure in spillways concrete structure in Whaley Bridge area due to heavy rainfall that poses a risk of failure to Whaley Bridge dam in Derby. The incident was managed through evacuating downstream side of the dam area, lowering in level of water through pumping and a temporary repair by dropping sand bags in the damaged section of the dam. Furthermore, the revolutionary technological change e.g. Robotics and Autonomous System (RAS), in addition to its potential application in mapping and condition assessment of aging water and sewerage underground infrastructure in the water sector, can help in detecting such failure in much advance to manage such events and minimising their impacts. The conceptual framework can be used to assess adoption of innovation and to diagnose the reasons resulting in lack of adoption and to take measures to improve adoption of innovation. By manipulating factors in the framework, companies or authorities can have better control over individuals’ beliefs about innovation and subsequently their behavioural intention of adopting innovation.

Appendix A

Stakeholder Consultation Questionnaire

01. Innovation Adoption Model

The study results revealed that the intention to adopt innovation in Water and Sewerage Companies (WaSCs) was found to be more greatly affected by the perceived ease and difficulty in adoption (of innovation), rather than the perceived advantages (of innovation). The regulatory and industry dimensions and resources were found important and significantly associated with perceived ease and difficulty to adopt innovation. Regulation, perceived cost efficacy and other benefits were found significant and associated with perceived advantage. Four other factors: perceived risks, attitude, organisation's aspiration and collaboration were found significant directly associated with intention of innovation adoption. The figure below shows the model of individual's adoption of innovation in WaSCs.



Organisation Name:

Please use this space to tell what do you think about the study findings of adoption of innovation?

02. Regulation

		Research Findings and Suggested Improvements
R1	Sharing of risks and rewards of innovation	The analysis found that all the risks of innovation failure remain with a water and sewerage company (WaSC) which limit innovation adoption in WaSCs. Sharing of risks in the event of failure and rewards for successes among WaSCs, supply chain, customers and other potential beneficiaries could increase innovation in WaSCs and supply chain.
R2	A longer price control period	The analysis highlighted that five-year duration of AMP period is too short for the realisation of benefits of outcomes and totex. The decisions made under totex and outcomes are for a longer period, potentially for the life of an asset. A longer-term price control period is likely to increase innovation in WaSCs considering outcomes and totex environment.
R3	Inclusion of large-scale research projects in water companies' business plan	The inclusion of large research projects in WaSCs' business plan could increase innovation in WaSCs and their supply chain.
R4	Pragmatic service delivery	Water companies face additional risks of increasing cost for political intervention and unpredictable situation. An inclusion of a procedure of having a conversation between WaSCs, regulators, customer challenge groups and politicians to ensure agreement on services delivered under an agreed pre-defined envelope of services in the AMP period could reduce the risks of increasing cost due to political intervention.
R5	Regulatory alignment	An alignment in regulatory expectations and WaSCs' aspiration could assist companies to set clearer longer-term outcomes.
R6	Increasing Flexible consenting	An increase in the flexible consenting could encourage novel solution from a wide range of catchment-based solutions.

Your response:

Please indicate your response to above findings. If you have further views/comments please add in the space below.

Nr.	Agree	Neutral	Not Agree
R1			
R2			

R3			
R4			
R5			
R6			

Please use this space to share your views/comments:

03. Policy

		Research Findings and Suggested Improvements
P1	Clarity of research priorities at national level and future form of the industry	The study found that there is a lack of clarity in WaSCs about the national level priorities over longer-term research in the water sector from the government. WaSCs need a very clear policy on research, clarity on research priority areas at the national level and the future form of the industry and water companies from the government. Clarity on these aspects could increase longer-term research activities in water companies and their supply chain.

Your response:

Please indicate your response to above findings. If you have further views/comments please add in the space below.

Nr.	Agree	Neutral	Not Agree
P1			

Please use this space to share your views/comments:

04. WaSCs Behaviour Change

		Research Findings and Suggested Improvements
B1	Behavioural change towards innovation adoption	The most frequently reported reasons for the mind-set of using conventional solutions / approaches by individuals in WaSCs were found as risk-avoidance, blame culture and an individual's past experiences. Behavioural change programme, engaging individuals and empowering them in the process of innovation could reduce the inertia in adopting new technologies/products, and could motivate individuals in contributing towards innovation.
B2	Creating a culture of exploring solutions globally	The analysis found that individuals in WaSCs do not try innovation similar to as it is tried in other industry such as manufacturing or information technology or firms such as Google, Amazon, and Apple etc. WaSCs should create a culture of exploring solutions globally to bring in innovative ideas and technology in the company from rest of the world and other industries.

Your response:

Please indicate your response to above findings. If you have further views/comments please add in the space below.

Nr.	Agree	Neutral	Not Agree
B1			
B2			

Please use this space to share your views/comments:

05. Collaboration

		Research Findings and Suggested Improvements
C1	Increasing collaboration across WaSCs	The analysis found that there is not sufficient joint working culture and sharing of information across WaSCs as a sector. WaSCs can do much more innovation collectively as a sector rather than working in isolation. Ofwat should work with WaSCs in reviewing provisions of economic regulation that discouraging them to join as a sector in dealing sector's challenges collectively.
C2	Increasing collaboration	A closer working relationship between regulators and WaSCs could align medium (5 to 10 years) and longer-term (more than 10 years) goals and aspirations which could encourage WaSCs to up-take medium and longer-duration research with supply chain. Ofwat could further promote and facilitate a closer working culture between WaSCs and regulators.
C3	Collaboration with supply chain	Increasing more collaboration between WaSCs and supply chain could increase innovation adoption in WaSCs and innovation development in supply chain.

Your response:

Please indicate your response to above findings. If you have further views/comments please add in the space below

Nr.	Agree	Neutral	Not Agree
C1			
C2			
C3			

Please use this space to share your views/comments: