

essense

Izobraževanje za podporo
pametnih okolij za
starejše

Poročilo o stanju in razvoju
pametnih bivališč in AAL v
metodi BIM: potrebno
znanje, spremnosti in
kvalifikacije.

2. različica



Erasmus+

Naslov projekta	Višješolski program o informacijskem modeliranju v gradbeništvu za razvoj pametnih okolij za starejše
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Dokument	O1-A3 Analiza
Različica	2.
Avtor	Ageing Lab

Spremembe v dokumentu

Različica	Datum	Spremembe
1.	maj 2019	Začetna različica dokumenta.
2.	junij 2019	Končna različica poročila.

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1. Uvod.

Projekt ESSENSE želi oblikovati in razviti **skupni učni načrt in učni pristop na za gradbeno informacijsko načrtovanje** (ang. **Building Information Modeling - BIM**) k načrtovanju, izgradnji in upravljanju javnih in zasebnih okolij za starejše odrasle. To bo naslovilo učne potrebe visokošolskih študentov iz področja gradbeništva in sorodnih sektorjev (arhitekti, inženirji, BIM menedžerji, vodje objektov in notranji oblikovalci), ki bodo pomembne za trg dela in bodo obravnavale potrebe družbe.

Gradbeništvo je pomemben del gospodarstva in družbe EU. Prispeva k okrog 9% BDP v EU in neposredno zagotavlja približno 18 milijonov delovnih mest. Prav tako ustvarja delovna mesta za visoko usposobljene in spodbuja naložbe v druge panoge, kar vodi v dodatne socialne in gospodarske koristi.

Metodologija BIM in njena vse bolj razširjena uporaba v gradbeništvu želi na dolgi rok digitalizirati gradbeni proces.

Povpraševanje po javnih in zasebnih bivališčih prilagojenih potrebam starejših odraslih naj bi se v prihodnjih letih okreplilo. Do leta 2050 naj bi se število ljudi v EU starih nad 65 let povečalo za 70%, število ljudi starih nad 80 let pa za 170%. To pomeni, da bodo državljeni EU preživeli več let v okoljih zasnovanih za mlajše in bolj zdrave ljudi, s čimer se bo povečalo tveganje, da bodo starejši odvisni od drugih, izolirani in imeli težave z duševnim zdravjem. Človeku prijazno fizično in socialno okolje je bistvenega pomena, da bodo ljudi lahko ostali zdravi in avtonomni tudi v svoji starosti.

Uporaba BIM za projektiranje, gradnjo in upravljanje večnamenskih notranjih okolij, bo prispevala k zahtevam EU na področju staranja prebivalstva ter hkrati spodbujala varno in zdravo staranje.

Strokovnjaki iz gradbenega sektorja priznavajo, da je uporaba BIM dragocena in področje, kamor bi se arhitektura, inženirstvo in gradbeništvo morali usmerjati.

Raziskava gradbenih podjetij iz leta 2011 kaže, da podjetja raje najamejo diplomante, ki imajo konceptualna znanja in programske spremnosti iz področja BIM. Podjetja izpostavljajo prednosti BIM večin takoj za sedanjost kot tudi za bližnjo in daljno prihodnost (Ku & Taibet, 2011)¹.

Pomoč iz okolice pri samostojnem življenju (ang. **Ambient Assisted Living - AAL**) si prizadeva izboljšati kakovost življenja starejših in okrepliti industrijo na področju inovacij in tehnologije zdravega staranja: "Udobno staranje v digitalnem svetu".

¹ Ku, K. and Taibet, M., (2011). *BIM experiences and expectations: The constructors' perspective*. International Journal of Construction and Research, 7(3), 175-197.

Glavni cilji so:

- Spodbujanje razvoja inovativnih izdelkov, ki temeljijo na izdelkih, storitvah in sistemih IKT za zdravo staranje doma, v skupnosti in na delovnem mestu.
- Ustvarjanje tržnih razmer za razvoj industrije izdelkov in storitev za zdravo staranje z vzpostavljanjem evropskega okvira, ki podpira razvoj standardiziranih rešitev in olajšuje njihovo umestitev na lokalni, regionalni in nacionalni ravni, ob upoštevanju različnih socialnih preferenc in regulativnih zahtev.

Pametna stanovanja oz. digitalne domače tehnologije omogočajo avtomatizacijo in usklajevanje vseh elektronskih naprav v domovih, tako da jih je mogoče nadzorovati. Njihov cilj je izboljšati kakovost življenja ljudi z ustvarjenjem notranjih okolij, ki povečujejo raven samostojnosti in dobrega počutja. Pri implementaciji digitalnega doma pride v poštev množica elementov in različnih sistemov nastanitve: centralno upravljanje, centralizirani sistemi, uporabniški vmesniki, ipd. Ne smemo pozabiti tudi na različne vrste senzorjev, ki nadzorujejo stavbe in njihove uporabnike.

Glavni cilj tega poročila je ozaveščanje industrije arhitektуре, inženirstva, gradbeništva, izobraževalne skupnosti ter lokalnih in regionalnih oblasti o prednostih tako BIM procesov kot pametnih podpornih življenjskih okolij, kar bo bodočim študentom promoviralo učni program in vplivalo na lokalne in regionalne načrte in politične odločitve.

2. SWOT analiza: trenutna uporaba BIM pri načrtovanju in gradnji objektov za starejše odrasle in pregled o implementaciji pametnih stanovanj in AAL tehnologij v teh okoljih.

2.1 Uvod.

Ta analiza predstavlja študijo o trenutni uporabi BIM procesov pri projektiranju, gradnji in obnavljanju javnih ali zasebnih okolij za starejše odrasle, kot so stanovanja, večstanovanjski prostori, dnevni centri, geriatrične enote, ipd., kot tudi pregled o tem, kako so koncepti pametnih stanovanj in AAL umeščeni v ta okolja.

Identificirali in analizirali smo primere dobrih praks - okolij, ki podpirajo aktivno, zdravo in pozitivno staranje ter uporabo načel AAL. Analiza posveča posebno pozornost povratnim informacijam različnih zainteresiranih skupin, kot so podjetja in delavci, študenti, javni organi, skrbniki in sorodniki starejših, ter zagotavlja informacije, ki so potrebne za pripravo privlačnejših učnih vsebin s tem, ko prepozna izvive s katerimi se srečujejo obstoječe pobude z vidika znanja, spretnosti in kompetenc na različnih ravneh: industrije, pedagogike, zakonodaje itd.

2.2 Metodologija.



Pripravili smo vprašalnike (Priloga 1) za zbiranje informacij o trenutnih praksah in študijo primerov novih / prenovljenih okolij, bodisi javnih (dnevni centri, geriatrični oddelki, večstanovanjski objekti) ali zasebnih stanovanj, ter o uporabi BIM procesov in AAL tehnologij pri načrtovanju, gradnji in upravljanju novih in obnovljenih objektov za starejše odrasle.

Identificirali smo 30 uspešnih primerov iz prakse v državah konzorcija. Poleg tega so nekateri člani Akcije COST SHELD-ON prispevali informacije o obstoječi praksi ustvarjanja okolij za starejše z metodologijo BIM in AAL tehnologijami.

V Prilogi 2 je na voljo pet izmed analiziranih primerov (izpustili smo imena podjetij, da bi ohranili njihovo zasebnost).

Povzetek in SWOT analiza zbranih podatkov o uspešnih primerov iz prakse je predstavljena v nadaljevanju.

2.3. SWOT analiza – študija primera.

Sledеča analiza povzema zbrane podatke o uspešnih primerih iz prakse.

Glavni cilj je opredeliti, kako se v nove ali obnovljene stavbe, kjer bivajo starejši odrasli, vključuje tehnologija AAL. Orisali bomo nekatere značilnosti orodij in uporabnikov, kot so njihov profil in stopnja sprejemanja tehnologije, naslovili pa bomo tudi specifična vprašanja v zvezi z tehnologijo (npr. nastavitev, varnost in vzdrževanje naprav).

Poleg tega bomo obravnavali uporabo BIM pri načrtovanju, gradnji in upravljanju objektov za starejše odrasle.



SWOT analiza

<p>Prednosti</p> <ul style="list-style-type: none"> • Profili uporabniških skupin, ki uporabljajo AAL Uporabniki zajeti v študijah primerov: starejši nad 65 let, nekateri med njimi so razmeroma neodvisni, medtem, ko drugi potrebujejo pomoč. V študiji so tudi negovalci in strokovnjaki, ki sodelujejo pri skrbi za starejše. V nekaterih primerih so vključeni bolni ljudje • AAL tehnologije, ki se izvajajo v študijah primerov: <ul style="list-style-type: none"> - Pametni senzorji, ki komunicirajo s pametnim domom: Nadzor radiatorjev, nadzor osvetlitve, pametna vodna ura, detektor gibanja, gumb za alarm ob padcih, daljinsko upravljanje oken, višinsko nastavljivi aparati, ukazi podani s kretnjami, računalniško prepoznavanje čustev, nadstropje s sistemom za detekcijo padca, biodinamična svetloba, pametni pohištveni elementi (npr. višinsko-nastavljivi kuhinjski elementi z avtomatskim odpiranjem vrat), WC s senzorsko tehnologijo za prepoznavanje življenjskih znakov, avtomatski dvig zaves, ojačevalec zvokov, štedilnik z daljinskim upravljanjem, sistem za pridobivanje energije, detektor nedejavnosti, brezžična AAL tehnologija. 	<ul style="list-style-type: none"> • Profili uporabniških skupin, ki uporabljajo AAL Uporabniki zajeti v študijah primerov: starejši nad 65 let, nekateri med njimi so razmeroma neodvisni, medtem, ko drugi potrebujejo pomoč. V študiji so tudi negovalci in strokovnjaki, ki sodelujejo pri skrbi za starejše. V nekaterih primerih so vključeni bolni ljudje • AAL tehnologije, ki se izvajajo v študijah primerov: <ul style="list-style-type: none"> - Pametni senzorji, ki komunicirajo s pametnim domom: Nadzor radiatorjev, nadzor osvetlitve, pametna vodna ura, detektor gibanja, gumb za alarm ob padcih, daljinsko upravljanje oken, višinsko nastavljivi aparati, ukazi podani s kretnjami, računalniško prepoznavanje čustev, nadstropje s sistemom za detekcijo padca, biodinamična svetloba, pametni pohištveni elementi (npr. višinsko-nastavljivi kuhinjski elementi z avtomatskim odpiranjem vrat), WC s senzorsko tehnologijo za prepoznavanje življenjskih znakov, avtomatski dvig zaves, ojačevalec zvokov, štedilnik z daljinskim upravljanjem, sistem za pridobivanje energije, detektor nedejavnosti, brezžična AAL tehnologija.
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	<p>življenja (ADL); duševno zdravje in kognitivna stimulacija; notranja in zunanja mobilnost; dobro počutje; socialne interakcije in izolacija.</p> <ul style="list-style-type: none"> • Kraji, kjer se nahajajo AAL tehnologije: stanovanjski kompleksi, stanovanja, geriatrične enote, skladišča, simulirana stanovanja, patronažna služba (SAD), bolnišnice, zunanje površine okoli oskrbnih centrov • Te tehnologije so najbolj uspešne, ko so uporabniki seznanjeni z upravljanjem sistema. • Uporabniki sprejemajo tehnologijo, ko je uporabna, dostopna in poceni. Funkcije, ki so uporabnikom blizu, zmanjšujejo negotovost in povečujejo sprejemljivost. • Uporabniške skupine uporabljujo omenjene rešitve / tehnologije v interakciji s sistemom in nadzorovanjem parametrov v hišah, kot so temperatura, svetloba in vlažnost. • Včasih se uporabniki učijo uporabe tehnologije od svojih vrstnikov. • Zasebnost podatkov je zaščitenega z upoštevanjem GDPR. • Merila za dostopnost so zagotovljena v večini primerov. • Uporaba BIM zagotavlja skladnost s standardi dostopnosti in zaščite v zgradbah.
Slabosti	<ul style="list-style-type: none"> • Nekatero pohištvo, kot npr. zložljive postelje, je težko vključiti zaradi pomanjkanja prostora. • Posamezne tehnološke rešitve so odvisne od potreb uporabnikov in njihovih posebnih značilnosti. • Kognitivni upad pri uporabnikih lahko privede do težav pri uporabi tehnologije. • AAL tehnologije prisotne na trgu so drage. • V nekaterih primerih podjetja niso odgovorna za vzdrževanje tehnologij, ki so jih ustvarili. • Pomanjkanje znanja in spremnosti pri uporabi BIM omejuje uporabo te metode pri načrtovanju in gradnji novih in obnovljenih javnih ali zasebnih stavb za starejše odrasle. • Uporabo BIM smo identificirali le redko. • Pametne naprave zahtevajo zanesljivo internetno povezavo.



Priložnosti	<ul style="list-style-type: none"> • Priložnost za ustvarjanje dostopnih tehnoloških izdelkov s konkurenčnejšimi cenami. • Potreba po skupni platformi za integracijo obstoječih sistemov AAL. • Potreba po usposabljanju za uporabo BIM. • Olajšanje skrbi za starejše ljudi. • Oskrbovalce je potrebno vključiti že v zgodnjih fazah načrtovanja BIM. • Potrebno je usposabljanje o tem integraciji tehnologij z BIM.
Grožnje	<ul style="list-style-type: none"> • V nekaterih primerih so končni uporabniki odgovorni za vzdrževanje naprav in tehnologij, kar povzroča dodatne stroške. • Funkcije naprav lahko niso prilagodljive posameznim značilnostim končnih uporabnikov. • Splošen razvoj in standard kakovosti za izdelke je treba še opredeliti. • V obstoječih stavbah lahko primanjkuje prostora za preoblikovanje prostorov z namenom izboljšanja dostopnosti do skupnih prostorov.

3. Znanje, spremnosti in kompetence potrebne za uporabo BIM procesov v pametnih bivališčih.

3.2. Uvod

Cilj projekta ESSENSE Erasmus+ je ustvarjanje učnega tečaja o integraciji 1) pametnih okoljskih rešitev za podporo pri samostojnem življenju (AAL) in informacijskega modeliranja v gradbeništvu (BIM) v grajeno okolje za podporo aktivnega in zdravega staranja. Eden od prvih korakov za dosego tega cilja je ugotoviti sedanje prakse na tem področju in katera nova znanja, veštine in kompetence so potrebne za napredok. Začeli smo s pripravo ankete za strokovnjake z gradbenega področja o različnih temah povezanih z BIM in pametnimi zgradbami, vključno s sedanjimi praksami pri gradnji, aktivnemu staranju, IKT in potrebnim znanjem za (bodoče) zaposlene na tem področju (vprašalnik je na voljo v Prilogi 3). Opravili smo tudi intervjuje s strokovnjaki iz industrije, kjer smo jih povprašali o trenutnih praksah in stališčih v zvezi z BIM (vprašalnik je na voljo v Prilogi 4). Nazadnje smo pripravili pregled trenutno razpoložljivih učnih tečajev in predmetov o BIM in AAL v državah projektnih partnerjev (predloga je na voljo v Prilogi 5).



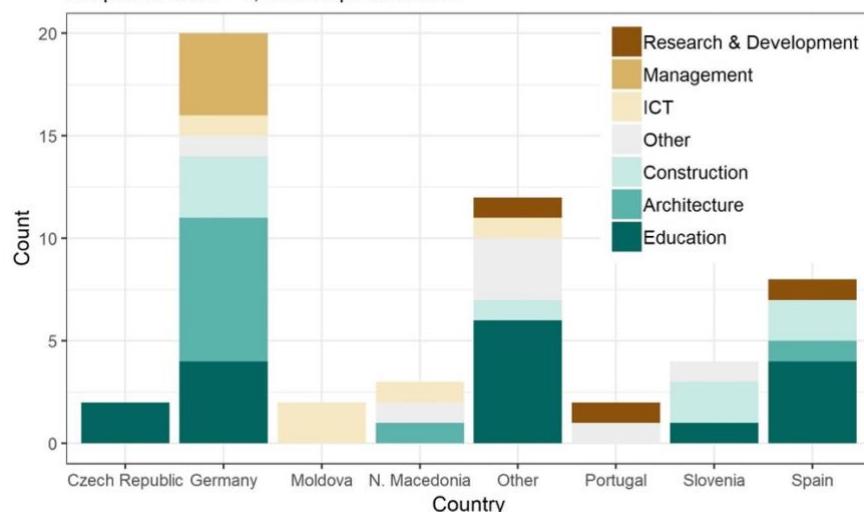
3.2. Anketa

Anketiranci

54 sodelajočih iz 19 držav je na odgovorilo na vsaj dva anketna vprašanja (Slika 1). Največ udeležencev prihaja iz Nemčije, sledijo pa jim anketiranci iz Španije, Slovenije in Severne Makedonije. Večina anketirancev je zaposlenih v izobraževanju, mnogi od njih so s področja arhitekture in gradbeništva, medtem ko drugi prihajajo iz IKT, menedžmenta, raziskovanja in drugih področij.

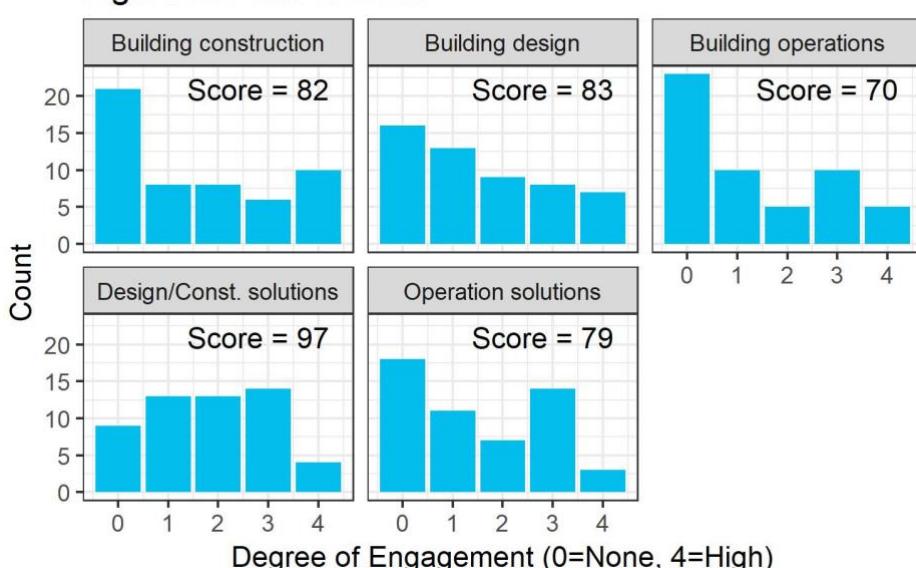
Figure 1: Respondent country

Response count > 1, total respondents: 54



Institucije, kjer so anketiranci zaposleni, se nekoliko ukvarjajo s področjem oblikovanja / konstrukcijskih rešitev, manj ukvarjajo z oblikovanjem, konstrukcijo in upravljanjem stavb in stavbnih rešitev in le malo ukvarjajo z upravljanjem bivanjskih prostorov starejših odraslih (Slika 2).

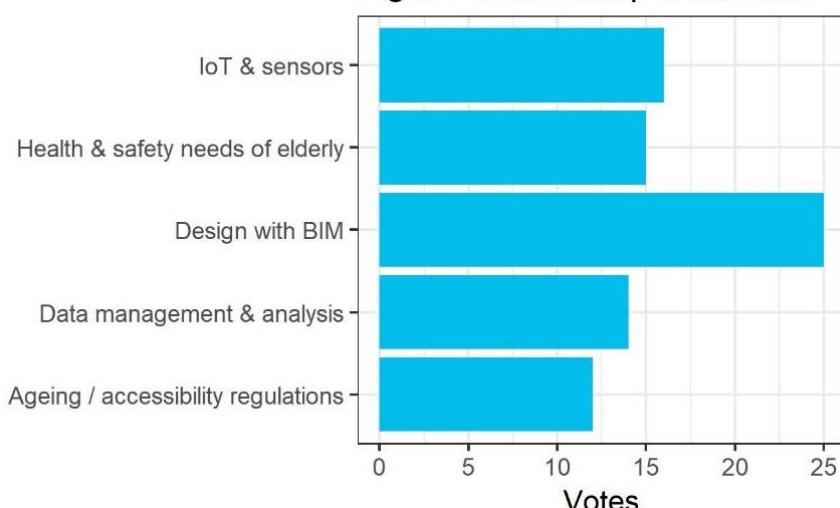
Figure 2: Field of work



Rezultati

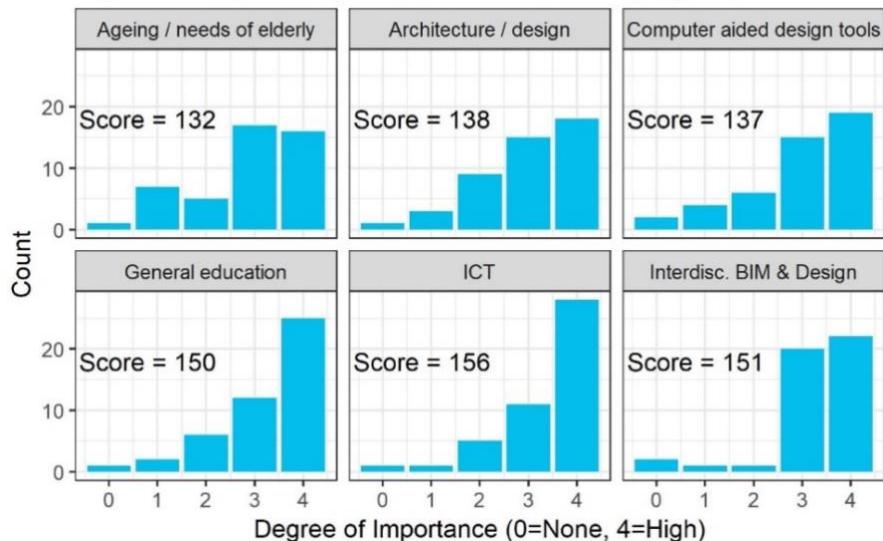
Anketiranci so izbrali 3 veščine, ki se jim zdijo najpomembnejše (od seznama 12 veščin) za diplomante iz področij povezanih s pametnimi zgradbami, staranjem in BIM. Anketiranci ocenjujejo dizajn z BIM kot najpomembnejšo spremnost (25 prejetih glasov). Naslednje visoko uvrščene veščine (med 12 in 16 glasov) so Internet stvari (ang. Internet of Things - IoT), senzorji in z njimi povezane storitve; zdravstvene in varnostne potrebe starejših odraslih; upravljanje s podatki in analize (zbiranje, shranjevanje itd.); ter staranje in s tem povezani predpisi v zvezi z dostopnostjo (Slika 3). Izven petih najboljše ocenjenih so sledeče veščine: socialne potrebe starejših (11 glasov), razvoj programske opreme (9 glasov), razvoj gradbenih informacijskih modelov, splošno načrtovanje, računalniško podprtvo načrtovanje (po 8 glasov), izpopolnjevanje standardov v oblikovanju (7 glasov) in pretvorba iz BIM v računalniško podprtvo proizvodnjo (6 glasov).

Figure 3: Most important skills



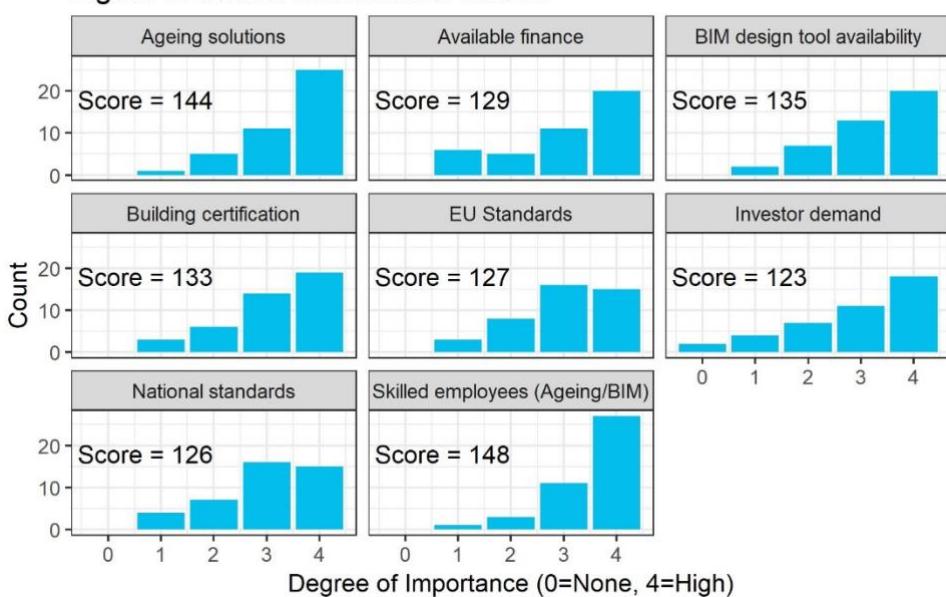
Praviloma udeleženci menijo, da so vse veščine predstavljene na Sliki 4 pomembne za bodoče zaposlene. Kot najpomembnejše veščine so izpostavili IKT, splošno izobraževanje in interdisciplinarna znanja na področju BIM in oblikovanja. Dojemane kot nekoliko manj pomembne (vendar še vedno pomembne) so veščine povezane s staranjem in potrebami starejših odraslih; arhitektura in oblikovanje; ter računalniško podprt oblikovanje orodij.

Figure 4: Skillset importance for future employees



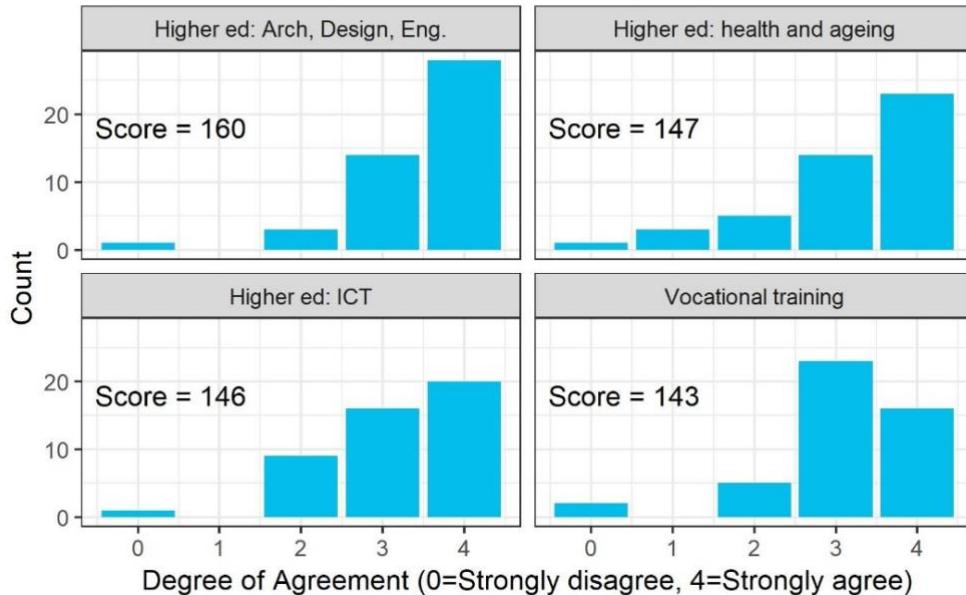
Anketiranci so ocenili pomembnost naslednjih gradbenih dejavnikov v zvezi z integracijo BIM z aktivnim, pozitivnim staranjem v grajenem okolju (Slika 5). Vsi predstavljeni gradbeni vidiki so v splošnem dojemani kot pomembni. Nekoliko bolj pomembni od drugih so razpoložljivost a) zaposlenih z veščinami na področju BIM in/ali pozitivnega, aktivnega staranja in b) razpoložljivost rešitev za pozitivno, aktivno staranje.

Figure 5: Critical construction factors



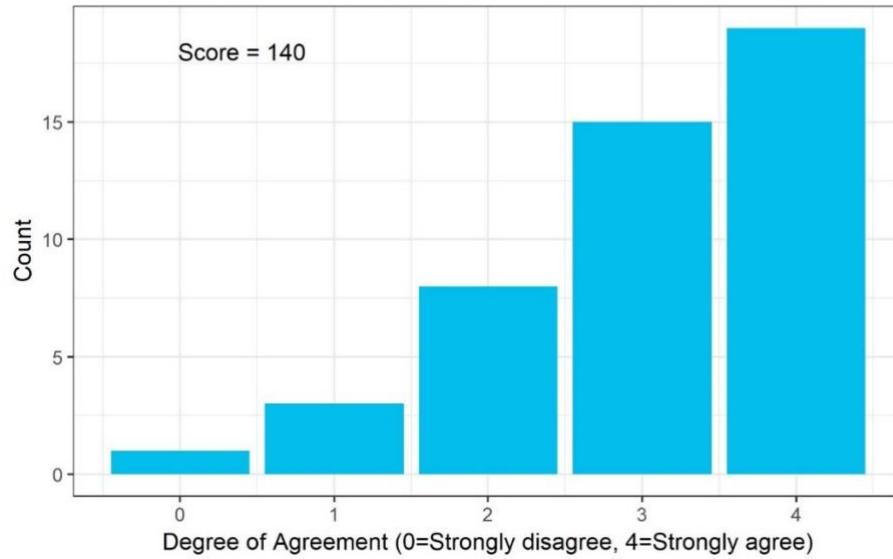
Anketiranci menijo, da je treba zagotoviti usposabljanje iz BIM in aktivnega staranja tako pri poklicnem usposabljanju kot v visokem šolstvu in sicer o a) informacijskih in komunikacijskih tehnologijah, b) zdravjem in staranjem in c) arhitekturo, oblikovanjem in inženirstvom (Slika 6).

Figure 6: Training in BIM and active ageing should be in...



Večina anketirancev se ali strinja ali zelo strinja, da so večine povezane z BIM in aktivnim zdravim staranjem pomembne na njihovem področju (Slika 7).

Figure 7: BIM and Healthy Ageing skills are important in my field



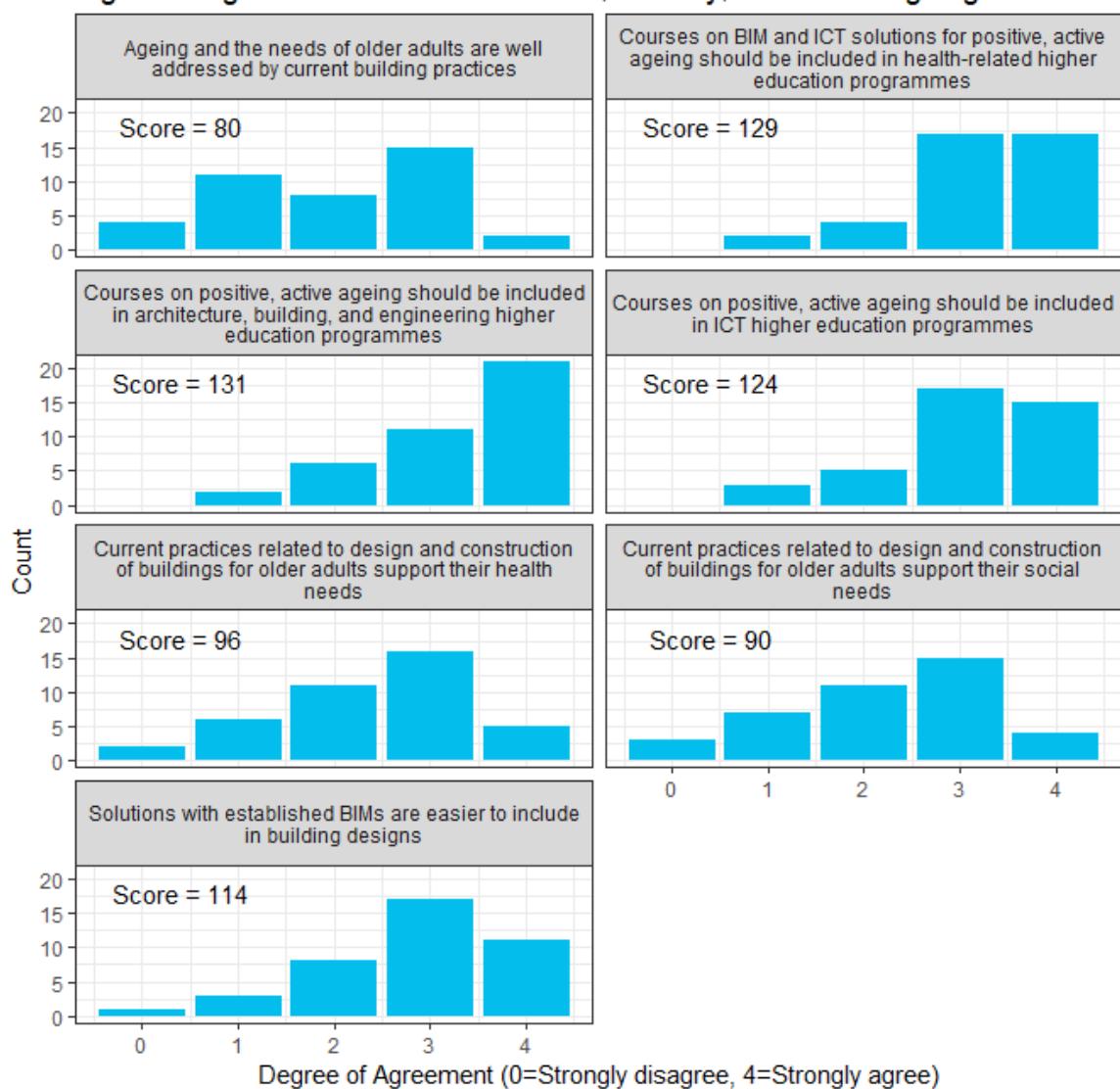
Udeleženci so bili pozvani, da razvrstijo naslednje vidike gradnje glede na njihovo pomembnost pri integraciji BIM in aktivnega, pozitivnega staranja (Slika 8). Oblikovanje novih objektov je praviloma izpostavljenko najpomembnejši vidik. (Za izračun točk ("Score") so bile rangom dodeljene točke, ki so bile nato seštete.)

Figure 8: Most important aspects of construction for implementing BIM and active ageing



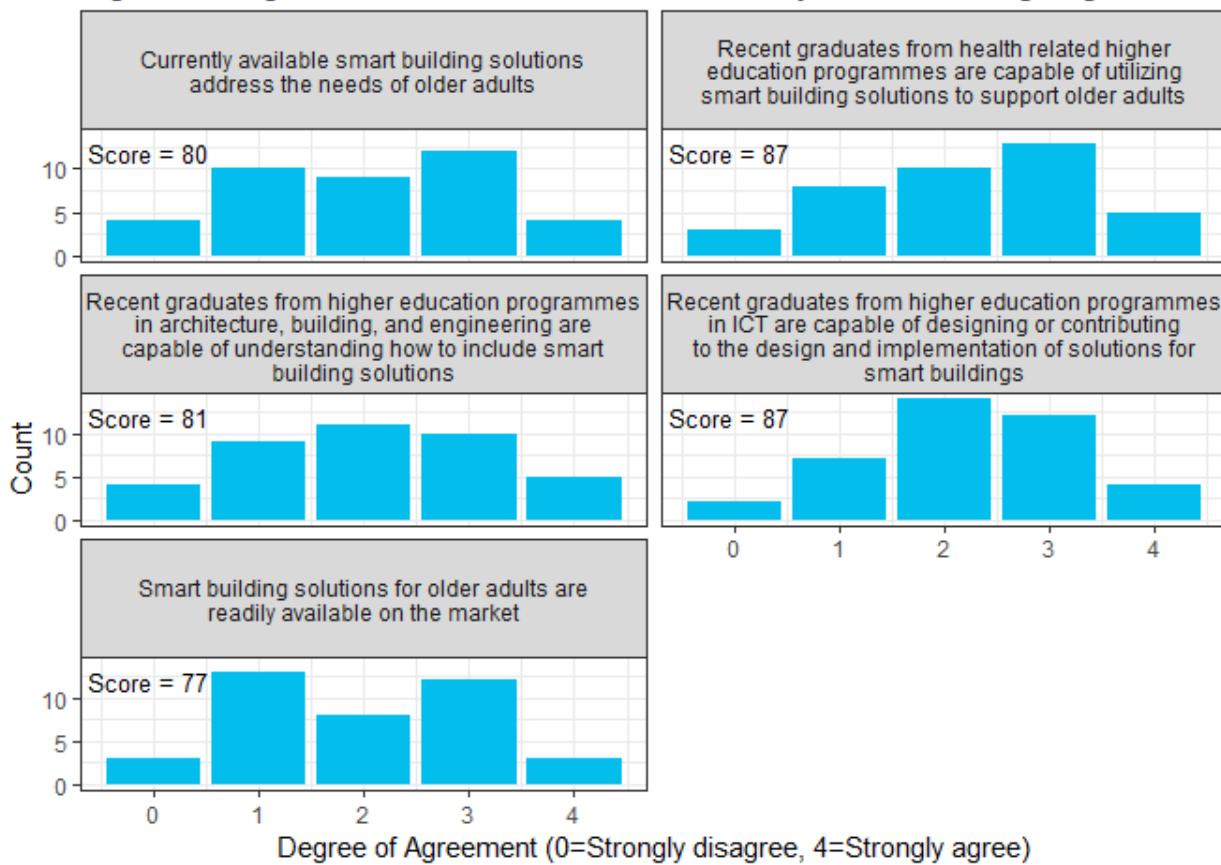
Na splošno imajo anketiranci mešana mnenja o tem, kako dobro obstoječe gradbene prakse naslavljajo staranje in potrebe starejših odraslih, kar kaže na vrzel, ki jo je potrebno zapolniti (Slika 9). Večina udeležencev meni, da je treba tečaje o pozitivnem, aktivnem staranju vključiti v visokošolske programe povezane z IKT, arhitekturo, gradnjo in inženirstvom. To nakazuje, da je identificirano vrzel smiselno zapolniti z visokošolsko vsebino, ki je dostopna študentom iz vsakega izmed naštetih področij. Praviloma se anketiranci nekoliko strinjajo, da sedanja praksa podpira socialne in zdravstvene potrebe starejših. Prav tako menijo, da bi bilo treba tečaje o BIM in IKT rešitvah za pozitivno, aktivno staranje vključiti v visokošolske programe povezane z zdravjem.

Figure 9: Agreement related to Positive, Healthy, and Active Ageing



Na splošno imajo anketiranci mešana mnenja o tem, 1) kako dobro sedanje gradbene prakse obravnavajo staranje in potrebe starejših odraslih in 2) kako zlahka dostopne so na trgu pametne gradbene rešitve za starejše odrasle (Slika 10). Prav tako imajo nasprotujoče si pogledi na zmožnosti a) nedavnih diplomantov iz področja zdravja za izrabo pametnih gradbenih rešitev, b) nedavnih diplomantov iz področja IKT za oblikovanje ali prispevanje k oblikovanju in izvajanju rešitev za pametne zgradbe in c) nedavnih diplomantov iz področja arhitekture, dizajna in gradbeništva za vključevanje pametnih gradbenih rešitev.

Figure 10: Agreement related to Positive, Healthy, and Active Ageing



3.3. Intervjuji.

Udeleženci.

Intervjuvali smo 14 gradbenih strokovnjakov (vsak predstavlja po eno institucijo) v zvezi s sedanjimi praksami BIM v njihovi organizaciji in njihovem splošnem pogledu na BIM. (Vprašalnik je na voljo v prilogi 4.) Sedem anketirancev prihaja iz Slovenije, šest iz Nemčije in en iz Španije. Večina udeležencev ima izkušnje na področju arhitekture in običajno dela na različnih tipih gradbenih objektov, vključno s stanovanjskimi, pisarniškimi in zdravstvenimi.



Poznavanje BIM in njegova vloga v podjetju / področju.

Anketiranci imajo praviloma dolgoročne izkušnje in poglobljeno znanje o BIM. So dobro seznanjeni z različnimi programskimi orodji in jih redno uporabljajo. V ustanovah mnogih anketirancev pa je BIM relativno nov za večino zaposlenih, vendar so ga na splošno željni, ali vsaj pripravljeni, sprejeti. V nekaterih primerih je bilo veliko zaposlenih na usposabljanju za BIM ravno v času intervjujev. Vsi intervjuvanci se strinjajo, da je BIM nujen za ostati konkurenčen in donesen. Poudarili so, da BIM prihrani veliko časa, zmanjša število napak in občutno izboljša sodelovanje. Praviloma naj bi BIM vodil do višje kakovosti izdelkov. Nekateri anketiranci so opozorili, da nekateri predlogi projektov in naročniki celo zahtevajo BIM, zaradi česar je pomembnost uporabe te metode še toliko bolj očitna. Čeprav nekateri menijo, da je zaenkrat še vedno možno biti uspešen brez uporabe BIM, se vsi strinjajo, da bo prehod na BIM v bližnji prihodnosti nujen.

Dostop do usposobljenih delavcev.

V nekaterih primerih imajo organizacije več zaposlenih, ki znajo delati s pomočjo BIM. Pogosto pa je to le en ali nekaj zaposlenih, medtem ko večina drugih oz. podjetje v celoti, počasi prehaja na BIM oz. namerava to storiti kmalu. Podjetja težko najdejo usposobljene delavce in poudarjajo pomen zagotavljanja kakovostnega izobraževanja za strokovnjake na tem področju. Anketiranci so ponavadi učijo BIM s pomočjo spletnih učnih tečajev; vaj, povezanih z določeno programsko opremo; ali usposabljanj, ki jih vodi nekdo od zaposlenih v podjetju. Hkrati pa anketiranci nimajo pozitivnega mnenja o obstoječih BIM učnih tečajih. Kljub temu, da so s temi tečaji seznanjeni in bi jih priporočili svojim zaposlenim, običajno poudarjajo, da so poučevane teme preveč teoretične in ne dovolj osredotočene na praktične spremnosti, ki jih je mogoče neposredno prenesti v delo. Osebe, ki imajo več izkušenj z BIM, opozarjajo, da je potrebno v usposabljanje vključiti nekatere napredne metode, kot npr. 6D BIM. Anketiranci soglasno menijo, da so izkušnje z BIM precejšnja prednost pri kandidatih, ki se prijavljajo na prosta delovna mesta.

BIM orodja.

Podjetja, ki imajo dostop do BIM orodij, pravijo, da so primerna za splošno uporabo in izpostavljajo številne prednosti uporabe BIM, vključno z izboljšano delovno uspešnostjo in učinkovitostjo, manjšim številom napak in nadgrajeno komunikacijo in sodelovanjem. Obenem pa mnogi poudarjajo, da v BIM orodjih primanjkuje veliko specifičnih funkcionalnosti in da je pomembno razviti orodja, ki lahko naslavljajo posebne potrebe, ki se v praksi pojavijo. Nekateri poudarjajo, da morajo z obstoječimi orodji BIM uporabiti veliko programskih dodatkov (oz. jih v nekaterih primerih razviti sami) ali pa uporabiti več razpoložljivih programskih orodij hkrati. Po mnenju anketirancev se težave pojavijo, ko različna podjetja uporabljajo različno programsko opremo, kar otežuje sodelovanje. Kompatibilnost programov med anketiranci na splošno velja za najbolj koristno in hkrati najmanj razvito lastnost BIM orodij. Uporabniki programske opreme BIM pravijo, da niso

vsa nova orodja, ki se na trgu pojavijo, nujno koristna. Poleg tega lahko obstoječa uporabna orodja postanejo precej zapletena in težja za uporabo, ko s časom pridobijo številne dodatne funkcionalnosti. A tudi dostop do različnih orodij ne zagotavlja dostopnost do metod, ki so zmožne nasloviti posebne izzive. Splošno mnenje je, da je uporabniško izkušnjo programske opreme BIM potrebno izboljšati. Mnogi uporabniki na tem področju pričakujejo napredek v bližnji prihodnosti. Pričakujejo tudi, da se bo splošna razširjenost BIM povečala.

BIM & senzorji, AAL, upravljanje zgradb.

Na splošno podjetja še niso v fazi uporabe BIM v povezavi z upravljanjem stavb, AAL ali senzorji v stavbah. Najpogosteje je razlog za to pomanjkanje usposobljenega osebja. V nekaterih primerih zaposleni nimajo dovolj znanja o pomembnih temah, kot so AAL intervence, ki lahko spodbujajo aktivno in zdravo staranje. Nekatera podjetja pa so že začela uporabljati BIM skupaj s senzorji, npr. za spremljanje procesa gradnje.

3.4. BIM & AAL učni tečaji.

Zbrali smo podatke o učnih tečajih oz. visokošolskih predmetih povezanih z BIM in AAL, ki so na voljo v Severni Makedoniji, Španiji, Nemčiji in Sloveniji. Večina identificiranih tečajev je na voljo na ravni dodiplomskega in poddiplomskega študija, povezanega z inženirstvom, arhitekturo in računalništvo. Identificirani učni tečaji so navedeni spodaj, posebej za vsako državo.

Severna Makedonija.

V Severni Makedoniji smo identificirali BIM in AAL predmete na fakultetah računalništva, inženirstva in arhitekture, na dodiplomski, poddiplomski in doktorski ravni. Vsi predmeti so izbirni in potekajo celoletno; večina ne zahteva predhodnega znanja iz področja. Večina odkritih predmetov se osredotoča na AAL in pokriva območje a) inteligentnega okolja, vključno s spremljanjem zdravja in aktivnosti uporabnikov stavb s pomočjo senzorjev, b) analize in napovedovanja časovnih vrst, vključno z odkrivanjem trendov in analizo vrednotenja zdravja in diagnostike, c) podpornih tehnologij, vključno s raznimi orodji, programsko opremo in mobilnimi aplikacijami, d) naprednih interakcij tehnologij, vključno z vmesniki za prepoznavo glasu, obrazne mimike in gest, e) razvoja mobilnih in vgrajenih aplikacij, vključno z nosljivimi, pametnimi napravami in omrežji na domu, f) medicinske informatike, vključno s procesiranjem biosignalov, računalniškim okoljem za izvajanje medicinskih postopkov in oblikovanje uporabniškega vmesnika in g) informacijske tehnologije za arhitekturo, z osredotočanjem na BIM.

Španija.

V Španiji smo identificirali BIM in AAL celoletne predmete na različnih univerzah in programih. Več AAL predmetov se osredotoča na zdravo in aktivno staranje. Vsaj dva magistrska programa sta v celoti namenjena

področju aktivnega in zdravega staranja. Predmeti zajemajo širok razpon tem, vključno s kognitivno stimulacijo, e-zdravstvenimi tehnologijami, IKT in čustveno inteligentnostjo, ter fizičnimi, socialnimi in prostočasnimi dejavnostmi. Predmeti običajno vključujejo segment o možnosti IKT za izboljšanje obstoječega zdravstvenega sistema. Čeprav so opisani programi in predmeti v prvi vrsti namenjeni študentom na področju zdravja, se lahko vpišejo študenti iz mnogih področjih (npr., farmacije, biologije, kemije). Identificirali smo tudi magistrski program o BIM s posebnim poudarkom na vodenju projektov z BIM, poleg drugih predmetov, ki so v veliki meri osredotočeni na BIM. Predmeti ponavadi vključujejo širok spekter tem povezanih z BIM, na primer, različna programska orodja in projektno vodenje. Poleg standardnih visokošolskih programov in predmetov, so nekateri magistrski programi in predmeti na voljo na spletu.

Nemčija.

V Nemčiji smo identificirali več predmetov, ki se osredotočajo predvsem na AAL. Poleg tega obstajata vsaj dva magistrska programa povsem osredotočena na AAL. Programi in predmeti pokrivajo širok spekter tem, s poudarkom na teoretičnih in praktičnih vidikih, strojno in programsko opremo ter mobilno in medicinsko tehnologijo. Usposabljanje osredotočeno na prakso poudarja nove in perspektivne teme, kot so e-mobilnost in ergonomija. Na dodiplomski in poddiplomski ravni smo identificirali številne tečaje z BIM kot glavno temo. V vsaj enem magistrskem programu je BIM na voljo kot glavni študijski modul. V mnogih primerih je BIM pomembna tema v dodiplomske in poddiplomske programih inženirstva. Običajno študijski predmeti zaobjemajo projektno vodenje z BIM skupaj z različnimi tehnično usmerjenimi temami, vključno z raznimi programskimi orodji, načrtovanjem, inženirstvom in splošno dobro prakso. V primerih, ko BIM ni v ospredju študijskega programa ali predmeta, je običajno zajet v programih ali predmetih o digitalni gradnji, energetsko učinkovitemu dizajnu ali v drugih predmetih gradbenega inženirstva.

Slovenija.

V Sloveniji smo identificirali tako obvezne kot izbirne predmete, ki vključujejo BIM; na dveh univerzah, predvsem na fakultetah za arhitekturo in gradbeništvo. Večina predmetov ne zahteva nobenega predhodnega znanja, medtem ko so nekateri predmeti na voljo na višji ravni in pričakujejo osnovno znanje s področja IKT in BIM. Vsaj dva študijska programa sta popolnoma osredotočena na BIM; zagotovljata široko pokritost s poučevanjem uporabe BIM v vseh fazah projekta in poudarjata celoten proces, od ideje do končnega modela stavbe. To vključuje različne vsebine, vključno z BIM povezanimi podatki, metodami, standardi in orodji. Običajno pa BIM ni osrednja tema predmeta, temveč je zajet v predmetih o tehnologiji v arhitekturi in gradbeništvu. Ponavadi se študenti seznanijo z različnimi BIM orodji. Različni programi poudarjajo uporabo BIM za različne namene. Nekateri predmeti, na primer, spodbujajo sodelovanje, ki je omogočeno z uporabo BIM, drugi pa se bolj osredotočajo na specifične cilje, kot je uporaba BIM pri izgradnji



fasad. Pogosto je poudarjeno praktično znanje, kjer se od študentov pričakuje, da bodo po zaključku predmeta lahko samostojno načrtovali in implementirali BIM na manjših projektih.

4. Zaključki: Znanje, spretnosti in kompetence, ki so potrebni za uporabo BIM v pametnih bivališčih za aktivno in pozitivno staranje.

BIM metodologija obravnava gradbeno industrijo v svetovnem merilu: gre za skupinsko delovno platformo, ki uporablja moderne digitalne tehnologije za učinkovito upravljanje načrtovanja, gradnje in upravljanja s stavbami.

Kako lahko ustvarimo cenovno dostopna urbana in pametna stanovanja? Milijoni se ne morejo približati dobrim / primernim stanovanjskim rešitvam. Uporaba BiM podpira mednarodno skupnost za prihodnje tehnološke izzive, kar lahko spremeni način načrtovanja, gradnje in upravljanja naših stavb in s tem optimizira stroške v celotnem življenjskem ciklu projekta.

Z uporabo BIM lahko predvidimo neskladnosti pri dizajnu, preprečimo težave še preden se pojavijo pri gradnji in optimiziramo celoten proces načrtovanja, kar je še posebej pomembno na področju AAL in pametnih stanovanj. V javnem sektorju to pomeni prihranek javnih sredstev, v privatnem sektorju pa povečevanje dostopnosti stanovanj, implementacijo sodobnih pristopov in boljše nadzorovanje stroškov vse od faze načrtovanja do prenehanja življenjskega cilja stavbe. Uporaba te metodologije pomeni spremembo odnosa v gradbeništvu, spodbuja usposabljanje delovnih skupin, vključno z vsemi vključenimi v proces oblikovanja od zgodnjih faz naprej.¹

Metodologija BIM ima odločilen vpliv na prihodnje usposabljanje inženirjev, saj se bodo morali ti naučiti ne samo tehničnih veščin za uporabo BIM, temveč tudi razumevanja vlog, ki jih imajo različne osebe vključene v proces gradnje. Za univerze lahko to pomeni spremembo učnih načrtov v smeri interdisciplinarnega sodelovanja med različnimi področji (npr. arhitekture, gradbeništva, inženiringa gradbenih storitev, inženirstva, upravljanja objektov) v okviru skupnih projektov. (Vlada)²

Ugotovili smo, da gradbeni strokovnjaki na splošno vidijo BIM, ALL in orodja IKT kot bistvena za strokovnjake na tem področju. Menijo, da veščine iz teh področij prinašajo znatne prednosti v delovnem procesu in bodo postale še pomembnejše v prihodnosti. Prav tako menijo, da je znanje o staranju in potrebah starejših odraslih pomembno za gradbene strokovnjake. V skladu s tem so mnenja, da je treba usposabljanje o teh temah ponuditi tako v poklicnem usposabljanju kot v visokošolskih programih povezanih z 1) informacijskimi in komunikacijskimi tehnologijami, 2), zdravjem in staranjem in 3) arhitekturo, projektiranjem in inženirstvom.

Oblikovanje z BIM je na splošno dojemano kot najpomembnejša veština za diplomante na tem področju. Anketiranci poleg tega visoko ocenjujejo veštine povezane z:

- Internetom stvari in senzorji ter z njimi povezanimi storitvami.
- Zdravstvenimi in varnostnimi potrebami starejših odraslih.
- Upravljanjem s podatki in njihovo analizo (zbiranje, hranjenje itd.).
- Staranjem in povezanimi predpisi o dostopnosti.

Znanje, ki so ga anketiranci dojemali kot nekoliko manj pomembno za diplomante vključuje: socialne potrebe starejših, razvoj programske opreme, razvoj gradbenih informacijskih modelov, dizajn, računalniško podprt dizajn, doseganje standardov pri dizajnu in pretvorbo iz BIM v računalniško podprto proizvodnjo.

Po mnenju anketirancev bi morali bodoči zaposleni biti večji predvsem v:

- IKT.
- Interdisciplinarnemu področju BIM in dizajna.
- Splošni izobrazbi.

Poleg tega naj bi bili seznanjeni z arhitekturo in oblikovanjem, računalniško podprtimi orodji za oblikovanje ter s staranjem in potrebami starejših.

Za uspešno implementacijo BIM in pristopov za aktivno in pozitivno staranje pri načrtovanju novih stavb je po mnenju anketirancev bistvenega pomena, da imajo dostop do 1) delavcev z znanjem na področju staranja in BIM in do 2) rešitev v zvezi s pozitivnim / aktivnim staranjem. Anketiranci menijo, da so pomembni tudi drugi dejavniki, vključno z nacionalnimi in EU standardi, financami in vlagatelji, certificiranjem stavb in dostopom do BIM orodij.

Udeleženci opozarjajo, da bi lahko trenutne prakse v zvezi z gradbenimi rešitvami in staranjem bistveno izboljšali. Mnoga podjetja imajo težave s pridobivanjem zaposlenih, ki so usposobljeni za BIM. Kljub temu, da podpirajo zaposlene pri udeleževanju obstoječih BIM učnih tečajev, pravijo, da so učne vsebine po njihovem mnenju preveč teoretične in se ne osredotočajo na znanja, ki so neposredno prenosljiva v prakso. Čeprav sta BIM in AAL del več študijskih predmetov na univerzitetni ravni, so le redko osrednja vsebina predmeta in so ponavadi prisotni v kratkem obsegu znotraj širše teme ali predstavljeni le za namene zelo specifične uporabe. V mnogih primerih gradbeni strokovnjaki ne uporabljajo BIM v povezavi z upravljanjem stavb, AAL ali stavbnimi senzorji zaradi pomanjkanja usposobljenega osebja. Jasno je, da lahko študentom in

strokovnjakom izjemno koristi celovit in sistematicen učni tečaj, ki združuje BIM, ALL in zdravo ter aktivno staranje.

¹ (*Utica, idr.*)

² (*Liebchen*)



5. Priloge.

Priloga 1: Vprašalnik za intervju.



Template 01-Essense

A) General Information about Institution, user groups:

- 1) What is the name of your firm?
- 2) Which user groups use your facilities or device? (Profile, degree of dependence, models of coexistence)

B) Use of technology (AAL)

- 3) Which AAL solutions/technologies do you provide and what challenges do they address?
- 4) Where and how are they used (e.g. type of building; wearable device and/or ambient-integrated sensors)?
- 5) In which settings do they perform best (and worst)?
- 6) How do user groups use your solutions/technologies? Do you differentiate physical attributes of devices, services, etc.?
- 7) What is your general approach to data privacy and security?
- 8) What is your firm responsible for in deploying your technologies? For example: are installation, set-up, and maintenance included in your sales price?
- 9) If more than one technology is provided, which ones are the most successful? And why do you think they are?
- 10) What are the advantages of your technologies/solutions over your competitors?
- 11) What feedback is provided by the different types of users? What do they complain about? What do they love about it or think is really useful?
- 12) Could you give a brief summary of your business models for the products/services offered?
- 13) Has your technology been modelled for simulation or BIM?

C) Accessibility

- 14) How do you ensure the facilities or devices accomplish of the universal accessibility criterion according to national laws where your products are sold or used?

D) Ethical Principles

- 15) Do your AAL technologies account for ethical principles stipulated in each region?



Priloga 2: Primeri uspešne prakse.

Primer 1



Template 01-Essense

General Information about Institution, user groups:

1) What is the name of your firm?

Primer 1.

2) Which user groups use your facilities or device? (Profile, degree of dependence, models of coexistence)

The solutions generated are applied to diverse contexts and user groups that have a big impact in multiple areas. Solutions pay special attention to the daily home activities in order to create better life conditions for elderly adults in their own homes with multiple profiles and degree of dependence.

A) Use of technology (AAL)

3) Which AAL solutions/technologies do you provide and what challenges do they address?

The solutions are based on Ambient Intelligence. This term refers to environments that are sensitive and responsive to the presence of people and their feelings and needs. Environments combine different ICT-related disciplines like sensing, networking, pervasive computing, human-computer interaction, artificial intelligence, etc. Moreover, it is fundamental to have other disciplines involved in order to truly revolutionize our quality of life by applying it.

4) Where and how are they used (e.g. type of building; wearable device and/or ambient-integrated sensors)?

It has three services:

- Smart Lab. This is a real apartment with multiple and heterogeneous sensors and actuators that are connected to a unified middleware. This environment can be used to test solutions.
- Software. A set of graphic software tools to monitor in an easy way a set of sensors of different types in your environment.
- Repository. It allocates multiple datasets from both external sources and our own resources. These datasets are available for the community.

5) In which settings do they perform best (and worst)?

We have a great expertise to analyse and deploy solutions in real and test environments

6) How do user groups use your solutions/technologies? Do you differentiate physical attributes of devices, services, etc.?

The concept is based on personalization. We apply computer algorithms to customize solutions to the needs and profiles of each user.

7) What is your general approach to data privacy and security?

Distributed storage and anonymous data.

8) What is your firm responsible for in deploying your technologies? For example: are installation, set-up, and maintenance included in your sales price?

We provide a set of services that have been support by national and international projects.

9) If more than one technology is provided, which ones are the most successful? And why do you think they are?

The easy way to manage our software solutions. This fact has been contracted with multiple users.



10) What are the advantages of your technologies/solutions over your competitors?

User Personalization

11) What feedback is provided by the different types of users? What do they complain about? What do they love about it or think is really useful?

Feedback is really positive. The users are really excited about automatic home monitoring, customization and ease of use of the software tools.

12) Could you give a brief summary of your business models for the products/services offered?

A personalized contract is made with the services offered with all terms fixed by both parties.

13) Has your technology been modelled for simulation or BIM?

No

B) Accessibility

14) How do you ensure the facilities or devices accomplish of the universal accessibility criterion according to national laws where your products are sold or used?

Through an exhaustive study and the personalization of each user.

C) Ethical Principles

15) Do your AAL technologies account for ethical principles stipulated in each region?

Yes, Ethical principles stipulated in the following levels regional, national and European are considering.

Primer 2



Template 01-Essense

A) General Information about Institution, user groups:

1) What is the name of your firm?

Primer 2.

2) Which user groups use your facilities or device? (Profile, degree of dependence, models of coexistence)

Very wide range of different inhabitants, depending on the installation.

- a. AAL apartment.
- b. Position of the interviewees: Division Manager Smart Home/AAL.
- c. AAL sample apartment.
- d. different objects: nursing homes, assisted living, homes of one's own.
- e. 39 apartments over with different packages to light without extension cable etc.
- f. New project: 70 apartments.

B) Use of technology (AAL)

3) Which AAL solutions/technologies do you provide and what challenges do they address?



AAL sample apartment: KNI basic equipment, radio bus systems which do not need batteries. Room equipped exclusively with digital power, Paul as home automation with simple user interface, Home controls radiators, lights, etc. and offers a uniform surface for various control devices, etc.

- a. Smart water clock, presence detector and motion detector to check that residents are not injured.
- b. Future Shape bottom with fall detection.
- c. Remote controlled windows.
- d. Toilet and washbasin adjustable height.
- e. Height-adjustable stove and sink in the kitchen.
- f. Rising bed.
- g. Orientation lights on the strips on the floor
- h. Stove guard, which detects whether the stove is too hot and switches itself off if necessary.

4) Where and how are they used (e.g. type of building; wearable device and/or ambient-integrated sensors)?

- a) Optimal technologies presented in AAL show apartment.
- b) Cooker guard is standard in all managed objects.
- c) Home emergency call device is standard in all serviced objects.

5) In which settings do they perform best (and worst)?

- a) Fall-detecting floor, especially in care facilities, useful for supporting nursing staff (especially at night). The Future Shape is particularly recommended.
- b) The fold-up bed works very well for people who have problems getting into the upright position.
- c) Bathrooms are a success factor in outpatient care: usually no nursing person is included in the calculation of space and radii within the bathroom → inadequate planning.
- d) Stove guard works very well (is already mandatory in Scandinavia in all new buildings).

6) How do user groups use your solutions/technologies? Do you differentiate physical attributes of devices, services, etc.?

- a) Feedback from older people "Self-assessment - hostile to technology" - but in principle people are already surrounded by technology (often do not perceive it) often a fear factor.
- b) But: if you can break down these fears by making them aware that they are surrounded by technology with washing machine, iron etc., then fear disappears.

7) What is your general approach to data privacy and security?

- a) Data protection and security in the sense of the residents the collected data are used only for the purpose of assistance.
- b) Greater relevance of this topic when everything is planned, built and operated with BIM.

8) What is your firm responsible for in deploying your technologies? For example: are installation, set-up, and maintenance included in your sales price?

- a) Mostly no subsidies, because nothing permanent.
- b) Special equipment such as drop-detecting floor not the standard, but usually too expensive for the standard.

9) If more than one technology is provided, which ones are the most successful? And why do you think they are?

- a) Stove detector works very well and does not call the fire brigade in every optical detection Primer of smoke.
- b) Future Shape Sensorics floor works best under fall detection floors.

10) What are the advantages of your technologies/solutions over your competitors?



The stove detector functions particularly well due to the numerous measurements, because it has many advantages over conventional fire alarms above the stove. These detect either only an optical signal in Primer or smoke (which happens much too fast) or by burnt particles.

- 11) What feedback is provided by the different types of users? What do they complain about? What do they love about it or think is really useful?

General problem: "self-assessment as hostile to technology" - but in principle people are already surrounded by technology (often do not perceive it) if you can break up these fears (by mentioning that they use washing machines and irons), fear disappears solution lies in communication with people.

- 12) Could you give a brief summary of your business models for the products/services offered?

At the moment there are many innovative projects that have to be implemented and established on the market, which is why further training and qualifications are very important.

C) Accessibility

- 13) How do you ensure the facilities or devices accomplish of the universal accessibility criterion according to national laws where your products are sold or used?

Not yet barrier-free built throughout Germany, far too few flats are available for those who need them (approx. 3-4 % barrier-free).

D) Ethical Principles

- 14) Do your AAL technologies account for ethical principles stipulated in each region?
- a) Varies according to living solution.
 - b) Social welfare provisions required in nursing facilities.
-

Primer 3



Template 01-Essense

A) General Information about Institution, user groups:

- 1) What is the name of your firm?
- Primer 3
- 2) Which user groups use your facilities or device? (Profile, degree of dependence, models of coexistence).

The main users of the system are the staff and caregivers of residences of disabled people. The residences include people from all ages with disabilities (primarily cognitive or physical), either born with this condition or acquired through accidents or illnesses. Some of the residents have high level of dependence.

B) Use of technology (AAL)

- 3) Which AAL solutions/technologies do you provide and what challenges do they address?
- The AAL solution monitors the resting time of residents remotely. It detects when the user is resting in the bed or in an armchair and identify possible dangerous situations, in Primer the resting time does not correspond to the usual behaviour of the resident.



- 4) Where and how are they used (e.g. type of building; wearable device and/or ambient-integrated sensors)?

It is an ambient integrated sensor, distributed in resident's beds and armchairs. Nowadays the system is working in a residence for disabilities but can be installed in geriatrics or private homes for monitoring elderly.

- 5) In which settings do they perform best (and worst)?

The solution performance is better when the users (residence staff and residents) are familiar with the system management.

- 6) How do user groups use your solutions/technologies? Do you differentiate physical attributes of devices, services, etc.?

The system includes a friendly web interface, very easy to understand and manage. The residence staff uses the web interface to manage and check the information on real time. The interface also includes sound alerts in Primer non-usual resident behaviour is detected.

- 7) What is your general approach to data privacy and security?

We have into account the GDPR directives.

- 8) What is your firm responsible for in deploying your technologies? For example, are installation, set-up, and maintenance included in your sales price?

Nowadays, our firm is responsible for installation, set-up and maintenance because the system is being validated. Sales price is under study.

- 9) If more than one technology is provided, which ones are the most successful? And why do you think they are?

The solution is only provided based on WIFI technology with textile sensors.

- 10) What are the advantages of your technologies/solutions over your competitors?

The main advantage on using textile sensors is that they can be integrated on bed surface and the user does not notice the existence of the sensors. Another advantage of the system is that WIFI networks are currently installed in most residences and personal homes, so the system does not require any additional device to be distributed (for example additional gateways or PC).

- 11) What feedback is provided by the different types of users? What do they complain about? What do they love about it or think is really useful?

We often visit our clients and obtain feedback personally. They consider the web interface very useful, not only for monitoring the residents resting time, but also for managing the bedrooms of their residents and control the distribution of them. They complain about the external power supply needed for the system.

- 12) Could you give a brief summary of your business models for the products/services offered?

We are a non-profit organization. The actual version of the system has been financed by public authorities and private sponsors. Nowadays, the business model is under study.

C) Accessibility

- 13) How do you ensure the facilities or devices accomplish the Universal accessibility criterion according to national laws where your products are sold or used?

We have almost 15 years expertise in electronic sensor networks and IoT field. Our staff and experts are updated on national and international laws and they have into account all requisites derived from these laws.

E) Ethical Principles

- 14) Do your AAL technologies account for ethical principles stipulated in each Region?

Our AAL system does not have any ethical contradiction.



Primer 4



Template 01-Essense

A) General Information about Institution, user groups:

1) What is the name of your firm?

Primer 4

2) Which user groups use your facilities or device? (Profile, degree of dependence, models of coexistence)

People of all ages with disabilities (primarily physical, cognitive), either born with this condition or acquired through accidents or illness. Most of the clients have a high level of dependence.

B) Use of technology (AAL)

3) Which AAL solutions/technologies do you provide and what challenges do they address?

Alternate keyboards, mouse devices for accessing computers (for education and work places), special education software, tablets, AAC devices (for communication), switches and toys for early intervention, smart home solutions (especially speech assistants) for environmental control.

4) Where and how are they used (e.g. type of building; wearable device and/or ambient-integrated sensors)?

Home, school, workplace, care homes and hospitals.

5) In which settings do they perform best (and worst)?

They perform best, when the environment (people/caregivers/communication partners ...) is also familiar with the system, has a positive attitude towards the solution and is committed to support its use.

6) How do user groups use your solutions/technologies? Do you differentiate physical attributes of devices, services, etc.?

Together with our clients we try to find the optimal solution which solves specific problems. We usually instruct clients on how to use the solution.

7) What is your general approach to data privacy and security?

We try to follow the directives of the GDPR.

8) What is your firm responsible for in deploying your technologies? For example: are installation, set-up, and maintenance included in your sales price?

We offer free consultations. If a product is purchased by Solutions, we give first level support in Primer of problems. Trainings (on how to use a product) are charged. We usually do not do installations or set-ups.

9) If more than one technology is provided, which ones are the most successful? And why do you think they are?

Tablet-based solutions seem to be most successful and best accepted.

10) What are the advantages of your technologies/solutions over your competitors?



Most of our recommended solutions are standard solutions which are also used by our competitors. Our self-developed solutions (software, apps, Integra Mouse) solve specific problems and satisfy specific needs, advantages are rather subjective.

- 11) What feedback is provided by the different types of users? What do they complain about? What do they love about it or think is really useful?

We do not gather feedback systematically. We often see our clients once and do not learn how they are using a solution. Generally, the clients want simple and reliant solutions. They sometimes complain about prices or when they encounter problems with a solution (required training time, loss of data, breakage, ...).

- 12) Could you give a brief summary of your business models for the products/services offered?

We are a non-profit organization; consultations are for free and financed by public authorities and private sponsors; recommended solutions can be bought. Trainings and workshops are charged. We also participate in various national and international research programs with increasing focus on AAL and high age-related challenges.

- 13) Has your technology been modelled for simulation or BIM?

No.

C) Accessibility

- 14) How do you ensure the facilities or devices accomplish of the universal accessibility criterion according to national laws where your products are sold or used?

We have 20 years of expertise in the field of AT and AAC; we are including experts in all our projects if needed and usually follow a user-centered co-design process when developing services/new products.

D) Ethical Principles

- 15) Do your AAL technologies account for ethical principles stipulated in each region?

No yet.

Primer 5



Template 01-Essense

A) General Information about Institution, user groups:

- 1) What is the name of your firm?

Primer 5.

- 2) Which user groups use your facilities or device? (Profile, degree of dependence, models of coexistence)

Profiles:

- a) Professional workers from the medical field, nurses, physiotherapists, general practitioners, and gerontologists.
- b) Professional workers from the field of social work, psychology, and andragogy.
- c) Users/patients: older adults (65-80 years old).



Levels of independence:

- a) Persons living independently or/and in the joint household with a partner or family members.
- b) People with limited independence, who live alone and who occasionally receive help from a caregiver.
- c) People with limited independence living in a joint household with a partner or family members.

B) Use of technology (AAL)

- 3) Which AAL solutions/technologies do you provide and what challenges do they address?

We are offering AAL technologies in the development phase:

- a) Monitoring health parameters (blood pressure, heart rate, blood oxygenation, body weight).
 - b) Monitoring activity in indoor environments.
 - c) SOS device connected with a call centre (in the testing phase).
 - d) Monitoring rooms and the use of devices (opening of doors, cabinets, and refrigerators).
 - e) Detection of water spills and smoke.
 - f) Medication delivery system.
- 4) Where and how are they used (e.g. type of building; wearable device and/or ambient-integrated sensors)?

We are using simulated environments (simulated apartments) and actual living environments (apartments and houses of users). The devices are typically mobile, while some are installed in the environment (SOS device, motion sensors).

- 5) In which settings do they perform best (and worst)?

- The best: At the time, they perform the best in situations with a single user in a setting. Each device is more or less responsive (depending on the device).
- The worst: Some sensors, mostly motion sensors, are sometimes activated when not appropriate.

- 6) How do user groups use your solutions/technologies? Do you differentiate physical attributes of devices, services, etc.?

Users are using the solutions based on their life situation. In the “living lab” we are testing many options (or services) from different providers.

- 7) What is your general approach to data privacy and security?

Data security and privacy are in line with GDPR.

- 8) What is your firm responsible for in deploying your technologies? For example: are installation, set-up, and maintenance included in your sales price?

Currently, we are responsible for testing the solutions and assessing the satisfaction of the end users. Our partners are responsible for technical aspects.

- 9) If more than one technology is provided, which ones are the most successful? And why do you think they are?

We are currently testing many options – more information will be available in 10 months. We are satisfied with personalized and modular solutions and the solutions that enable renting the equipment.

- 10) What are the advantages of your technologies/solutions over your competitors?

As said, more information will be available in 10 months.

The solution from our consortium is still in development.



- 11) What feedback is provided by the different types of users? What do they complain about? What do they love about it or think is really useful?

Users are most worried about protecting their privacy and the feeling they are being monitored. Also, they can be bothered by aesthetical aspects of the visible sensors/devices. In addition, they can get overwhelmed with large devices, especially wearables.

- 12) Could you give a brief summary of your business models for the products/services offered?

The business model is still in development and I cannot share it here. After we finish the development of the solution and the business model, our service will be in the market in 1.5 years.

- 13) Has your technology been modelled for simulation or BIM?

No.

C) Accessibility

- 14) How do you ensure the facilities or devices accomplish of the universal accessibility criterion according to national laws where your products are sold or used?

We are still in the development phase. Other solutions we have in the demo centre are handled by their manufacturers or providers.

D) Ethical Principles

- 15) Do your AAL technologies account for ethical principles estipulated in each region?

We are in line with ethical principles. For this purpose, we have an ethical commission in the project.



Priloga 3: Vprašalnik za spletno anketo.



General Questions:

Company field:

Age of company:

Position at company:

Time at company:

Country:

Please rate your firm's engagement with the following topics: [1 = not at all engaged, 5 = highly engaged]

- Design, production, or implementation of smart building solutions for positive, active ageing.
- Operation of smart building solutions for positive, active, ageing.
- Building design for older adults.
- Operation of living or shared space for older adults.
- Construction of buildings for older adults.

Topic 1: Necessary skills for smart buildings, ageing, and BIM

Which skills do you believe are most important to graduating students related to smart buildings, ageing, and BIM? (Choose 3)

- ICT – Software development (e.g., for BIM extensions).
- ICT – Data management and analysis (collection, storage, etc.).
- ICT – Internet of Things, sensors, and related services.
- Tools – Design with BIM.
- Tools – Conversion from BIM to computer aided manufacturing.
- Tools – Development of BIMs.
- Ageing – Regulations regarding accessibility.
- Ageing – Health & safety needs of older adults.
- Ageing – Social needs of older adults.
- Design – General design/architecture.
- Design – Computer aided design.
- Design – Meeting certification/standards requirements.

How would you rate the importance of the following areas of expertise on a scale of one to ten (one = lowest priority, 10 = highest priority)?

- ICT [1 – 10]
- Computer aided design tools [1 – 10]
- Ageing / needs of older adults [1 – 10]
- Architecture/Design [1 – 10]
- General education [1 – 10]
- Interdisciplinary training focused on BIM and design [1 – 10]

Please respond to the following statements [Agree, Disagree, I don't know]:



- Vocational training is a useful tool for increasing employee skills related to BIM and active, positive ageing.
- Higher education programmes in architecture, design, and engineering should provide training related to BIM and active, positive, ageing.
- Higher education programmes in ICT should provide training related to BIM and active, positive ageing.
- Higher education programmes in health or ageing should provide training related to BIM and active, positive ageing.
- Skills related to BIM and active, positive ageing are valuable for workers in my field.

Which skills do you believe are most useful for implementing BIM and active, positive ageing?

[Open ended]

Topic 2: Buildings and construction

How would you prioritize the following aspects of construction in terms of implementing BIM and active, positive ageing?

- Design of new buildings.
- Bidding, procurement, contracting.
- Construction management.
- Retrofitting / renovation
- Maintenance.
- Building management (during occupancy).

How important are the following related to implementing BIM and active, positive ageing? [1 = not important, 5 = very important]

- Investor demand.
- Available finance.
- National standards.
- European standards.
- Building certification systems.
- Availability of tools for design with BIM.
- Availability of solutions of positive, active ageing.
- Availability of employees with BIM and/or positive, active ageing.

Topic 3: Positive, active ageing

Please state the extent to which you agree with the following statements (1 = strongly disagree, 5 = strongly agree)

- Solutions with established BIMs are easier to include in building designs.
- Ageing and the needs of older adults are well addressed by current building practices.
- Current practices related to design and construction of buildings for older adults support their health needs.
- Current practices related to design and construction of buildings for older adults support their social needs.
- Courses on positive, active ageing should be included in architecture, building, and engineering higher education programmes.
- Courses on positive, active ageing should be included in ICT higher education programmes.
- Courses on BIM and ICT solutions for positive, active ageing should be included in health-related higher education programmes.



Topic 4: ICT solutions for positive, active ageing.

Please state the extent to which you agree with the following statements (1 = strongly disagree, 5 = strongly agree).

- Currently available smart building solutions address the needs of older adults.
- Smart building solutions for older adults are readily available on the market.
- Recent graduates from higher education programmes in architecture, building, and engineering are capable of understanding how to include smart building solutions.
- Recent graduates from higher education programmes in ICT are capable of designing or contributing to the design and implementation of solutions for smart buildings.
- Recent graduates from health-related higher education programmes are capable of utilizing smart building solutions to support older adults [*would like to phrase this differently*].

Closing.

May we contact you to follow up on your responses to this questionnaire? [Y / N]

If Y: Name, Email.

If N: thank you taking your valuable time to complete our questionnaire. You may learn more about the Essense project at: [URL].

Priloga 4: Dodatna vprašanja za udeležence študije primera.



Topic A: Familiarity with BIM and its role in your company/field.

QA.1: Please tell us about your familiarity with BIM.

QA.2: Please tell us about the general familiarity with BIM at your organization? (i.e., do your employees have these skills? Do you utilize a third party or partner organization with these skills?).

QA.3: Do you consider BIM as a necessary tool/skillset to be or remain competitive in your field? How does BIM contribute to competitiveness in your Primer?

Topic B: Access to skilled employees.

QB.1: Do your current employees have the appropriate skillset to work with BIM?

IF YES, QB.2_Y: How did your employees receive training? Was the training received effective? How has work experience contributed to worker expertise with BIM?

IF NO, QB.2_N: Are BIM training programmes available (e.g., Higher education or Vocational Training)? Are these programmes suitable? Why or Why not? Do you or would you support your employee's enrolment in BIM training programmes?

QB.3: How should training programmes change to address the needs of BIM for your company/field? What new knowledge.

QB.4: Would you be more likely to hire a candidate for a position if they had previous experience or training with BIM?

Topic C: BIM tools.

QC.1: How do current BIM tools meet the needs of your company/field? Do you have access to these tools?

QC.2: What features are most useful in BIM tools? Which features do you consider to be missing?

QC.3: What changes do you anticipate regarding BIM tools in the near future (within 5 years)?

Topic D: Other

QD.1: Do you currently or do you plan to utilize BIM in conjunction with tools like building systems management, ambient assisted living, or building sensors?

QD.2: Please share any other thoughts you may have related to BIM and your company/field.

QD.3: What challenges or difficulties do you see in reconciling the various requirements of specialty projects related to positive, active ageing (senior-friendly, barrier-free construction, AAL and BIM)? Please name a few key challenges.

QD.3a: What does it take to solve these challenges?

[These questions may be answered from the previous exercise]

What is your specialization in this area (e.g., architect, solution provider, planner, health facility operator, etc.)?

What type of building projects do you normally work on? (Housing, public, hospital, multi-family, multi-level).



Priloga 5: Predloga za zbiranje podatkov o učnih predmetih.



Course X	
Course Name	
Institution	
Country	
Link	(Link to website describing the course)
Credits offered	
Frequency	(Annually, Every other year, etc.)
Course Type	(Required / elective)
Course level	(1st Bologna / 2nd Bologna / other)
Avg. No. of students	
Prerequisites	
BIM-Related content	
Course outcomes (skills & competences after the course)	

